Los Angeles County Oak Woodlands Conservation Management Plan

DRAFT

Prepared by

Los Angeles County Oak Woodlands Habitat Conservation Strategic Alliance

October 27, 2009

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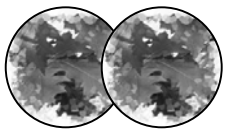

For

The County of Los Angeles
320 West Temple Street
Los Angeles, CA 90012

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Cover photos by Rosi Dagit, Ty Garrison & Christy Cuba

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EXECUTIVE SUMMARY

WHY LOS ANGELES COUNTY NEEDS AN OAK WOODLAND CONSERVATION MANAGEMENT PLAN

Los Angeles County (County) has a long history of concern for oak resources. It was one of the first counties in the state to enact an Oak Tree Protection Ordinance in 1982 to regulate these resources in unincorporated areas of the County. However, over half of the land development in the County has occurred in and near oak woodlands since this ordinance was put in place. If this rate of change continues, it is anticipated that all of the remaining woodlands on private lands under the County's jurisdiction will be developed by 2040.


Oak woodland Source: Rosi Dagit

The County shares the issue of oak woodland loss with other urban areas in California. In 2001, the state legislature responded to this problem by creating a fund for oak woodland conservation (SB AB 242). In 2004, they revisited the issue by amending the California Environmental Quality Act (CEQA) through SB 1334 to specifically address the impacts and mitigation of land development in oak woodlands. As of 2009, the Natural Resources Agency and California Air Resources Board now requires evaluation of the impacts of oak woodland conversion on greenhouse gas emission. A single large coast live oak can sequester over 9 tons of carbon dioxide in 50 years. Multiply this sequestration by the amount of oak woodlands, and the importance of oaks in mitigating greenhouse gas emissions is potentially enormous.

The County Oak Tree Protection Ordinance protects standing oak trees. It was not designed to manage oak woodlands and the values they provide to residents of the County (wildlife habitats, watershed and soil protection). More importantly, by focusing on existing trees, the ordinance has no provisions to ensure that standing oaks will be replaced by new trees in the future.

Reviews of the effectiveness of the existing ordinance indicate that more could be done to prevent the loss and degradation of both individual trees and oak woodland communities. Oaks under the

protected size of eight inches in diameter at four and a half feet above grade are often cut down before they interfere with land development. Individual oaks remain within housing or commercial areas, but often in a manner that reduces their value to communities and eliminates their connection to their natural hydrologic resources. Fragmentation is the rule not the exception. Mitigation planting of small oak seedlings does not realistically replace the suite of ecosystem functions provided by each single mature tree.

Los Angeles County is in the process of comprehensively updating its General Plan. Through the preparation of the Oak Woodlands Conservation Management Plan (OWCMP), the protection, enhancement, and restoration of oak woodlands can be integrated into the overall planning process of the General Plan update.

It is intended that the suggestions provided in the planning document will assist the County to develop a sustainable vision of oak woodland resources protection and enhancement over the next 50 years. Development of that vision would establish a foundation to balance the regulatory elements of the Oak Tree Protection Ordinance with incentives for actions such as voluntary conservation easements for oak woodlands.

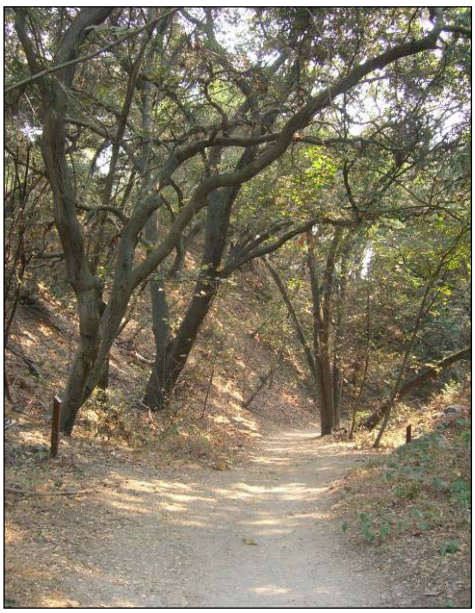
WHAT MAKES OAK WOODLANDS SO SPECIAL

Oak woodlands are much more than a collection of individual trees. As defined by the California Department of Fish and Game, an oak woodland is an oak stand with a greater than 10% canopy cover or that may have historically supported greater than 10% canopy cover. Associated with that canopy cover and connectivity, are over 300 vertebrate species and more than 5,000 invertebrates, not to mention hundreds of native understory plant species.

Common king snake in oak woodland, Santa Clarita
Source: Ty Garrison

Entering an oak woodland, you experience the complex interconnections of the trees, plants and animals that create a dynamic living system. While the Oak Tree Protection Ordinance has succeeded somewhat in preserving historic oak trees, it has failed to protect the woodlands as a functional whole.

Oak woodlands provide essential ecosystem function services, at little to no cost. The canopies of oaks filter out air pollution, absorb carbon dioxide, soften the rainfall allowing it to percolate into the ground and create islands of welcome shade and cooler temperatures. Hillsides covered with oaks don't erode as fast. Stream banks shaded by oaks slow down floodwaters and help filter out water pollutants. Oak woodlands provide extensive recreational opportunities that are easily accessed by the huge urban population of Los Angeles County. The health benefits provided by access to trails that wind through the oaks are immeasurable. For many people, a walk through the oaks is a welcome stress relief.



Trail in a riparian oak woodland , Monrovia
Source: Christy Cuba

Oak woodlands are an iconic part of the visual landscape of Los Angeles County. The daily commute of millions is enhanced by views of oak studded hillsides along crowded freeways.

Oaks and humans have a long history of inter-dependence. While few people today rely on acorns as a dietary staple, living in and among oak woodlands is clearly still important to many of us. Real estate prices for homes in or near oak woodlands are consistently higher than those without oaks or other natural spaces.

WHO WILL BENEFIT FROM THE OAK WOODLANDS CONSERVATION MANAGEMENT PLAN

Present and future residents of Los Angeles County directly benefit by living in and among oak woodlands. The County's Oak Tree Protection Ordinance has already identified oaks as having "valuable historical, aesthetical and ecological resources". The ecological services provided by functional oak woodlands contributes millions of dollars worth of avoided costs to mitigate air pollution and water pollution alone. Incentives for working with, rather than removing oak woodlands make economic sense, and help both the property owner and the community at large. Additionally, property owners will have a greater degree of certainty of what is required to work within oak woodlands. Both property owners and planners will have a framework for integrating oak woodland protection into the development process in a functional way.

COMPONENTS OF THE OAK WOODLANDS CONSERVATION MANAGEMENT PLAN

The OWCMP will contain the following information:

I. GOALS

Ideals promoted by the Los Angeles County Oak Woodlands Conservation Management Plan

II. BACKGROUND

Historic extent, existing oak woodlands, interaction between oaks and development, CEQA evaluation and carbon sequestration estimation

III. ELEMENTS OF THE PLAN

Measurable goals for preservation, conservation and sacrifice, economic resource values, incentive strategies for oak woodland conservation, successful monitoring and long-term stewardship

IV. OPTIONS TO CONSIDER FOR OAK WOODLAND CONSERVATION AND RECOVERY

General Plan Policy Recommendations, Public Outreach and Education, Partnerships and other recommendations

HOW YOU CAN MAKE A DIFFERENCE

This draft of the Los Angeles County Oak Woodlands Conservation Management Plan is an important first step, but it is **incomplete**. This draft of the plan contains a variety of background information throughout the sections to support the OWCMP's ideals. However, it is planned that the format of the ultimate OWCMP will consolidate the key planning elements, such as goals, definitions, maps, implementation guidelines, and potential incentive and mitigation options into the body of the document and shift the supporting information and studies into a comprehensive appendix. It is critical that all concerned stakeholders provide input, so that the plan is clear, functional and ultimately effective. Because this initial draft relied upon volunteer participation (very little funding for this effort!) several sections are in need of additional work. The idea is to use this document as a starting point for conversation. Spirited response to the draft guidelines promulgated herein and lively discussion among all stakeholders is anticipated. In Fall 2009, the plan will be presented to a variety

of professional and community groups in the hope of getting feedback. Based on that input, it is anticipated that the next version of the plan (winter 2010) will reflect a consensus on how best to assist the County in promoting the long-term sustainability of this valuable resource.

Valley oak, Santa Clarita valley Source: Ty Garrison

"If you think in terms of a year, plant a seed;
if in terms of ten years, plant trees;
if in terms of 100 years, teach the people." ~ Confucius

ACKNOWLEDGEMENTS

The development of the Los Angeles County Oak Woodlands Conservation Management Plan evolved thanks to the following supporters:

Los Angeles County Board of Supervisors' grants ($50,000)

Supervisor Michael Antonovich and Deputy Paul Novak

Supervisor Zev Yaroslavsky and Deputies Susan Nissman and Ben Saltsman

The Eaton Canyon Nature Center kindly hosted many of our meetings. Thanks to Mickey Long and all the staff that made us welcome.

Both the Los Angeles County Department of Forestry and Department of Regional Planning staff provided essential assistance with developing all phases of the plan, especially the maps.

The Western Chapter of the International Society of Arboriculture provided opportunities to share this plan and solicit input at several meetings. Thanks to Rose Epperson and the local staff for all their enthusiastic assistance.

SWCA Environmental Consultants graciously provided the use of their ftp site, which made sharing information much easier.

The energy and impetus to develop and produce this plan was a direct result of the efforts of the Los Angeles County Oak Woodlands Habitat Conservation Strategic Alliance. This broad based coalition of concerned representatives of agencies, resources, planners and consultants initiated this project in 2008 as a step towards establishing an equitable, consistent and well-considered plan to achieve the goals of oak woodland resource protection and long-term stewardship. Everyone volunteered in one way or another, allowing us to develop this plan on an extremely tight budget. Those who actually contributed sections or provided substantive revisions to this draft of the plan are starred!

Regular Participants include:

Greg Ainsworth*, Certified Arborist, E.S.A.

Orchid Black, CNPS San Gabriel Mts. Chapter

Cy Carlberg*, Registered Consulting Arborist

Janet Cobb*, CA Oak Foundation

Dan Cooper*, Biologist

Christy Cuba*, Certified Arborist & Env. Planner, Land Design Consultants

Rosi Dagit*, Certified Arborist, RCD of the Santa Monica Mountains

Joe Decryenaere*, Impact Sciences

Rose Epperson, President, Western Chapter, International Society of Arboriculture

Ty Garrison*, Senior Biologist, SWCA

Tamara Hanna, LA County Forestry

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Rebecca Latta*, Senior Arborist, SWCA

Fred McMurdo, Newhall Company and BIA representative

Stephanie Pincetl, UCLA Institute of the Environment

Teresa Proscewicz, Urban Forester, City of Glendale

Bill Romo*, Forester, LA County Forestry

Ben Saltsman*, Deputy of Planning, Supervisor Yaroslavsky

Tom Scott*, PhD., Integrated Hardwood Range Management Program

Jan Scow*, Registered Consulting Arborist

Mike Takeshita, Forester, LA County Forestry

John Tiszler*, PhD. National Park Service, SMMNRA

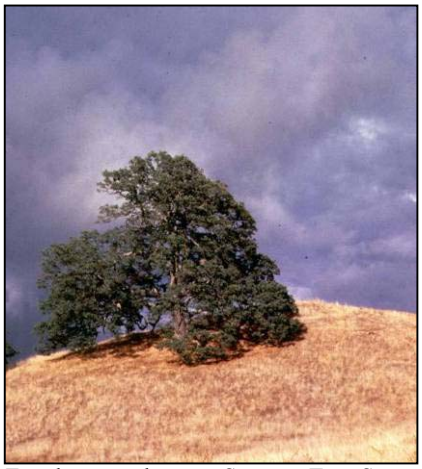
John Todd, Chief of Forestry, LA County Forestry

Canyon live oak seedling Source: Christy Cuba

Many other interested arborists, planners, and community representatives participated in meetings along the way. We are also grateful to the input of all the participants and presenters at the ISA meetings held in March and September 2009.

The series of meetings that explored a variety of ways to evaluate the economic value of oak woodlands benefited from the expertise of:

- Dr. Ken Baerenklau, Associate Professor, UC Riverside
- Dr. Bowman Cutter, Associate Professor, Pomona College
- Dr. David Sunding, Professor, UC Berkeley


Engelmann oak Source: Tom Scott

Student intern Dana Kittrelle of Pomona College provided valuable assistance with writing the incentives section of the plan and revising the economic values section.

Tom Gaman provided valuable input on describing carbon sequestration and the CEQA process.

UC Riverside staff Cara Washington and Matthew Davis worked hard to assist Tom Scott in preparing the maps.

Christy Cuba did a phenomenal job editing, formatting, and combining the information submitted by the writers to make it cohesive.

Tom Scott and Rosi Dagit did their best to provide a clear, readable document.

We owe a great deal of thanks to Ted Swiecki, who graciously allowed us to use his work on the *YOLO County Oak Woodland Conservation and Enhancement Plan* as a road map and inspiration. The tools provided by the Oak Woodland Impact Decision Matrix (Guisti et al 2008) were also invaluable.

Last but not least, the staff of the Resource Conservation District of the Santa Monica Mountains provided invaluable administrative support.

INTRODUCTION

Los Angeles County has a long history of concern for oak resources. It was one of the first counties in the state to enact an Oak Tree Protection Ordinance in 1982. This ordinance remains in place today and serves to regulate and mitigate impacts to individual mature oak trees over a specific size in diameter. While this level of protection is appropriate in some cases, reviews of the effectiveness of the existing ordinance indicate that more could be done to prevent further loss and degradation of both individual trees and oak woodland communities. Problems resulting from the focus on individual trees, rather than on the role each individual plays in the overall ecosystem are many. Protecting only mature trees results in loss of regeneration and creates a museum of old trees. Oaks under the protected size of eight inches in diameter four and a half feet above grade are routinely cut down so that they are not in the way of development. Individual oaks are "protected" within developments, isolated within parking lots or cut off from their natural hydrologic resources. Fragmentation is the rule not the exception. Mitigation planting of small oak seedlings does not realistically replace the suite of ecosystem functions provided by each single mature tree.

Coast live oak woodland Source: Ty Garrison

Oak woodlands are much more than a collection of individual trees. As defined by the California Department of Fish and Game, an oak woodland is an oak stand with a greater than 10% canopy cover or that may have historically supported greater than 10% canopy cover. Associated with that canopy cover and connectivity, are over 300 vertebrate species and more than 5,000 invertebrates, not to mention hundreds of native understory plant species. When you enter an oak woodland, you experience the complex interconnections of the trees, plants and animals that create a dynamic living system that stores and circulates water and energy, moderates temperatures, cleans the air and water, and supports the life both within and surrounding the woodland. While the Oak Tree Protection Ordinance has succeeded somewhat in preserving historic oak trees, it has failed to protect the woodlands as a functional whole.

The time is right to incorporate the protection, enhancement and restoration of oak woodlands into the overall planning process. There is a strong movement to balance the regulatory elements of the Oak Tree Protection Ordinance with incentives, such as voluntary conservation easements for oak woodlands.

Valley oaks Source: Ty Garrison

The OWCMP provides Los Angeles County with a valuable tool to identify measurable goals for protecting existing oak woodlands and for implementing successful mitigation, monitoring and regeneration efforts. Conservation planning grounded in science-based information provides critical information. The OWCMP provides a framework for both policy level outreach, as well as property level implementation opportunities. To realize the benefits of this precautionary planning, Forman and Collinge (1997) determined that once more than 40% of the natural vegetation is altered or removed, it becomes more difficult to maintain biological diversity.

We passed that threshold in Los Angeles County years ago.

What will the oak woodlands of Los Angeles County look like in 50 years? What is the long term vision of the County for protecting, managing and restoring oak woodlands? How can these goals be incorporated into the County Planning process in such a way that we:

- Provide incentives for voluntary conservation of oak woodlands on private property;
- Properly identify the costs to the community when existing oak woodlands are lost to development or conversion to other activities;
- Link mitigation at the project level to the long term conservation plan goals;
- Accurately identify cumulative impacts, and;
- Attempt to prevent any further net loss of oak woodlands in Los Angeles County

Los Angeles County needs an equitable way of estimating the value of oak woodland along the wildland-urban interface. Specifically, we need a credible system for calculating the value of oak

Oak Savannah in grazing lands Source: Ty Garrison

woodlands and the costs associated with woodland removal or degradation. Whereas the Council for Tree and Landscape Appraisers (CTLA) and the International Society of Arboriculture (ISA) has developed a system to assign value to individual oaks in landscaping, there are no commonly accepted means of valuing oak woodlands along the wildland-urban interface. The products developed for this plan can be used to build consensus among stakeholder groups on oak woodland evaluations during environmental audits and planning reviews, by focusing on mechanisms for calculating the values associated with oak woodlands.

There is strong evidence that suggests that the pattern of oak woodland distribution both historically and at present reflects the impacts of human management. Oaks and humans have coexisted in mutually beneficial ways for thousands of years. In the past, there were more oaks than humans. As the number of humans increases, we need to think carefully about how we can maintain existing, regenerate declining, and foster new places for this important resource.

There are many local organizations, public agencies and others involved in the effort to conserve and restore oak woodlands throughout the state of California. This plan reflects an effort to incorporate their recommendations and further their efforts to promote long-term stewardship of oak woodlands within Los Angeles County.

I. GOALS OF THE OAK WOODLANDS CONSERVATION MANAGEMENT PLAN

The Los Angeles County Oak Woodland Conservation Management Plan strives to accomplish the following goals:

GOAL Protect existing oak woodlands by creating a voluntary system, including landowner incentives, for protection, conservation and restoration of oak woodlands.

GOAL Provide guidelines for development of land use and infrastructure planning strategies that are consistent with oak woodlands conservation and restoration efforts.

GOAL Identify Priority Oak Woodland Conservation Areas adjacent to or within contiguous oak woodland habitat where focused restoration and voluntary conservation will decrease fragmentation and increase self-sustaining habitat areas.

Oaks in public recreation area Source: Rosi Dagit

GOAL Define a vision for long-term sustainability of oak woodlands such that functional ecosystems on multiple scales (parcel, watershed, regional) are maintained or enhanced over the next 50 years.

GOAL Maximize the total amount and connectivity of oak canopy cover incorporating species appropriate cover levels that will promote habitat diversity, and provide maximum ecosystem function benefits.

GOAL Increase the area covered by Valley, Engelmann, and other oak species that are now uncommon due to fragmentation and development.

GOAL Develop incentives for voluntary oak woodland conservation.

GOAL Provide a tool to assess the economic benefits of oak woodlands.

GOAL Identify strategies for evaluating oak woodland impacts that meet the current CEQA compliance requirements.

GOAL Coordinate oak woodland conservation, planning and restoration efforts with the Los Angeles County General Plan, the Santa Monica Mountains National Recreation General Plan, the Angeles National Forest General Plan and all local and state applicable conservation plans.

GOAL Balance the need to provide housing with the preservation of oak woodlands.

The OWCMP also addresses the requirements of the California Oak Woodlands Conservation Act (2004), which amended the Public Resources Code to require each county to determine whether a project may result in conversion of oak woodlands that constitutes a significant impact on the environment. This determination is made during review of individual projects as required by the California Environmental Quality Act (CEQA). If it is determined that oak woodland conversion exceeds the threshold for significant impact, then the county is required to implement one or more of the following mitigation alternatives:

- Conserve oak woodlands;
- Plant an appropriate number of replacement trees and maintain those trees for seven years;
- Contribute to the Oak Woodlands Conservation Fund, or;
- Meet other mitigation requirements required by the county.

When a project includes one or more of these mitigation elements, the project can be deemed in compliance with CEQA as it relates to oak woodlands. This Plan identifies a range of mitigation alternatives that conform to these requirements.

Preservation of oaks during grading, Malibu
Source: Christy Cuba

II. BACKGROUND

HISTORIC EXTENT OF OAK WOODLANDS IN LOS ANGELES COUNTY

Oaks and humans have a long, interrelated and interdependent history in Los Angeles. Understanding the nature of this relationship provides important context to our efforts to protect, preserve and restore oak woodlands in Los Angeles County.

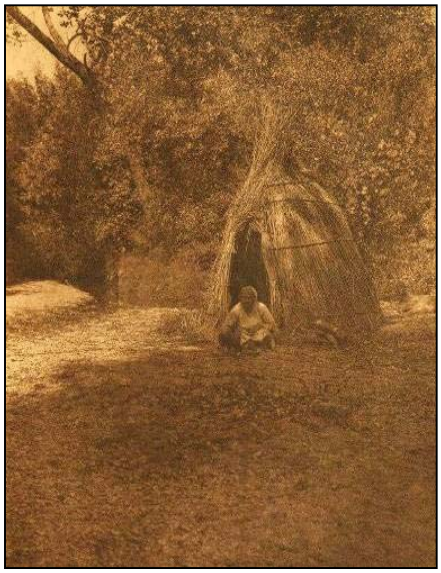
For over 25,000 years, oaks have played an important role in the landscape we know as Los Angeles County. Oak woodlands were key elements of a moist plant complex, more similar to current conditions in the Monterey region. Between 25,000 and 10,000 years ago, a variety of oak species were found in deep canyons, edges of chaparral, coastal sage scrub and along riparian corridors (Mount 1971). Mixed age stands supported a wide variety of birds, mammals, insects and related plant species. Wooly mammoths, sabre tooth tigers and other Ice Age fauna probably relied upon acorns as a seasonal food source, much as their current counterparts do.

Mule deer in riparian oak woodland
Source: Christy Cuba

Then as now, oaks were a keystone species in a complex ecosystem. Today there are over 5,000 insects, 80 species of reptiles and amphibians, 100 species of birds, and over 60 mammals that all rely on oaks for their survival (Pavlik et al. 1991*). The diversity supported by oak woodlands is a major reason why Los Angeles County hosts 20% of all species listed as federally endangered.*

Of these listed endangered or extinct species, perhaps the most notable loss has been the grizzly bear. Grizzly bears roamed the hills of L.A. County until the last one was killed in Sunland in 1916. Grizzlies relied heavily on acorns and used their huge claws to rip up the soil in search of roots and grubs. Their "tilling" helped cultivate oaks by reducing competitive annuals, and providing good places for acorns to grow. A mature grizzly was a big competitor for acorn resources. Archeologists estimate that the amount of acorns consumed by each bear equaled that consumed by as many as seven humans (Moratto, pers. comm.)

The first human inhabitants of Los Angeles were the early Tongva-Gabrielino, Chumash and Fernandeno/Tataviam Tribe, with the Tongva-Gabrielino group most widespread in central Los Angeles. Since at least 7,000 BC, the local Native Americans selected village sites near water and oaks. Oaks provided food, medicine, shelter and were actively managed to favor maximum acorn production (Blackburn and Anderson 1993). Low intensity fires were regularly used to clear the understory and remove competition.



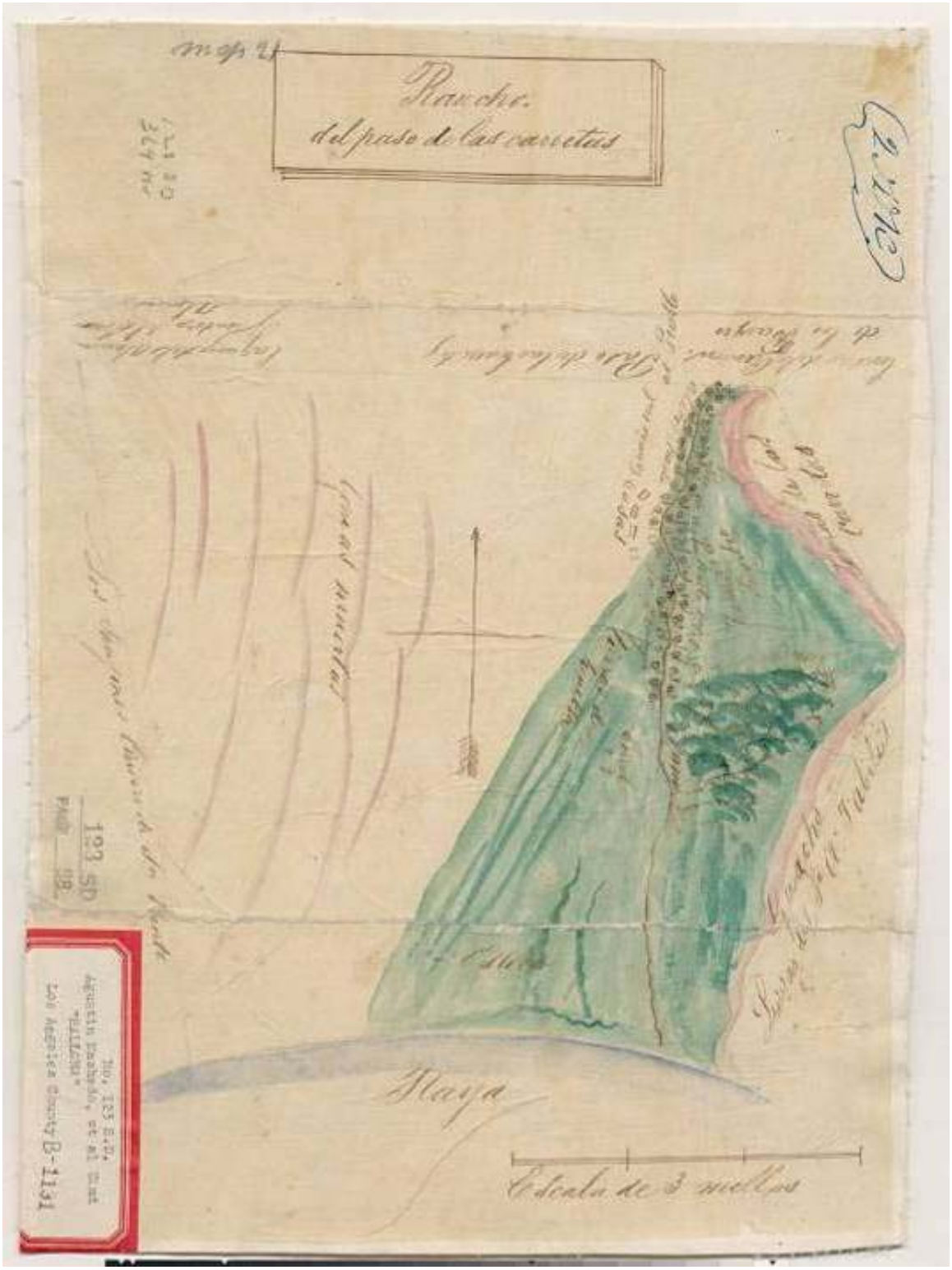
Woman grinding acorns
Source: www.FirstPeople.com

Harrington (1924) and others estimated that each person consumed between 700-1,000 pounds of acorns per year. A mature oak could produce approximately 140 pounds in a good mast year. Individual trees that were consistent acorn producers were passed down in families (McCawley, 1996). Distribution of oak woodlands was extensive when the early European settlers arrived. Most of the early diaries mention finding oaks along the canyon bottoms, slopes of the hillsides and across much of the San Fernando Valley. In 1769, the Portola Expedition traveled from what is now known as Santa Ana, up through the Puente Hills, along what is now Wilshire Blvd and followed what is now called Sepulveda Boulevard on their way north to San Francisco (Johnston 1962). Father Crespi described the route from the sacred spring located at University High School, over the Sepulveda Pass towards the San Fernando Valley.

"We set out at a little past 2 o'clock….taking a northward course through the mountains. These are quite high and rather steep, however, much covered everywhere with a great deal of grass (I have seen none better anywhere), and the hollow which we were following much lined with large sycamores, live oaks and white oaks."

With the coming of the Europeans, agriculture and grazing thousands of cattle and sheep transformed the landscape. As with the Native Americans, development was concentrated near water and oaks, both considered essential to survival. The Spanish Land grants often showed the streams and oaks on a property, as can be seen in **Figure 1 – Ballona Creek Land Grant.**

Figure 1 - Ballona Creek Land Grant [1]



[1] Source: Bancroft Library

Oaks are a prominent part of the descriptions the first arriving European settlers made of the land. It is said that in 1602 Sebastian Vizcaino, the first European to land at Monterey, used a coast live oak as a "church" for a religious ceremony, and that 168 years later Fray Junipero Serra said mass under the same tree. To the early arriving Spanish the oaks must have reminded them of their homeland where oaks are also a significant component of the landscape. Since the beginning of European settlement in California the oak has been praised in prose and poetry, cursed and removed by farmers and ranchers who wanted to use the land for other purposes, cut down and chopped up for railroad construction, steamship fuel, stove wood, and firewood and enjoyed by many for their aesthetic (and shade) value.

In 1792 George Vancouver, commander of the English ship *Discovery* said this about the oaks in the Santa Clarita Valley: "For about twenty miles it could only be compared to a park which had originally been closely planted with the true old English oak; the underwood, which had probably attended its early growth, had the appearance of having been cleared away and left the stately lords of the forest in complete possession of the soil which was covered with luxuriant herbage."

Development in urban-wildland interface Source: Rosi Dagit

As more and more oaks were removed to provide firewood and create more grazing space, the water table began to drop. Remaining springs were channelized into “zanjas”, further impacting the local hydrology (Gumprecht 1999). Predators were removed, and the consequences of increased rodent and livestock consumption of acorns, along with increased spread of annual grasses limited regeneration. Soils were compacted by the livestock and seedlings were eaten or trampled by many hooves.

The 1886 report of the California State Board of Forestry summarized the status of oak woodlands throughout the state, describing the forests of Los Angeles County as dominated by willows and oaks, suitable for “furnishing a large amount of firewood”. However, this is followed by a series of specific site anecdotes collected by Abbot Kinney, (at that time Chairman of the Board of Forestry) which clearly makes the connections between removing oak woodlands and the flooding, erosion and reduced

water tables that result (California Board of Forestry, 1886). **Figure 2** on the next page illustrates the **1886 Map of Timber and Forests of Southern California**.

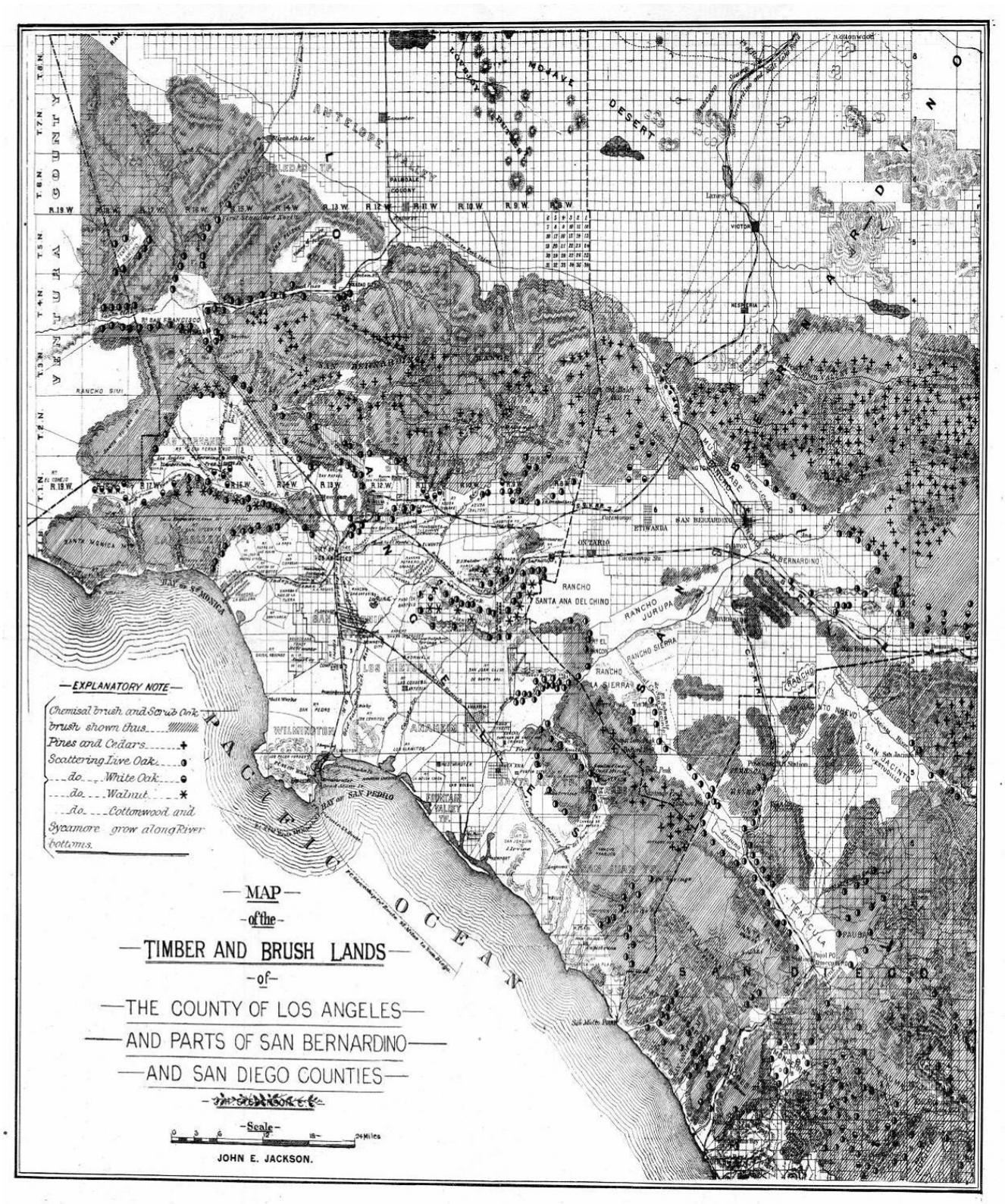
By the mid-1800's much of the economy of Los Angeles was based on leather production, using oaks as fuel, and a source of tannins. The other main impact came from widespread clearing to create vineyards and orchards. The population explosion began. The pattern of individual tree preservation was established, and the fragmented habitat we see today was fully developed by 1920.

The Gold Oak Source: L.A. Public Library Archive

Despite the widespread loss of oak woodlands, some individual oaks were considered to be quite special for historic and cultural reasons. The Gold Oak, located in Placerita Canyon, provided shade for Franscisco Lopez, who discovered gold while harvesting wild onions near the tree in 1842. The Peace Oak, located in the Cahuenga Pass was made famous when General Pico surrendered to John Fremont in January, 1847 creating the state of California. Neither of these oaks remain alive today.

The boom and bust economy that characterized the development of Los Angeles was largely dictated by the availability of water. Until the Los Angeles Aqueduct was completed in 1913, most water was delivered through the ever more complex web of zanjas that started in the 1700's. Oaks provided the main fuel source for the whole region until fossil fuels and electricity became available after 1910 (Forrest et al. 1981). The development of brick factories, need to provide everything from tool handles to tannin, introduction of roads and the railroad, all contributed to supporting a population explosion and resulting in the loss of more oak woodlands (Lyle and Safford 1997). By 1935, the majority of oaks that were easily accessed had been harvested.

Figure 2 - 1886 Map of Timber and Forests of Southern CA



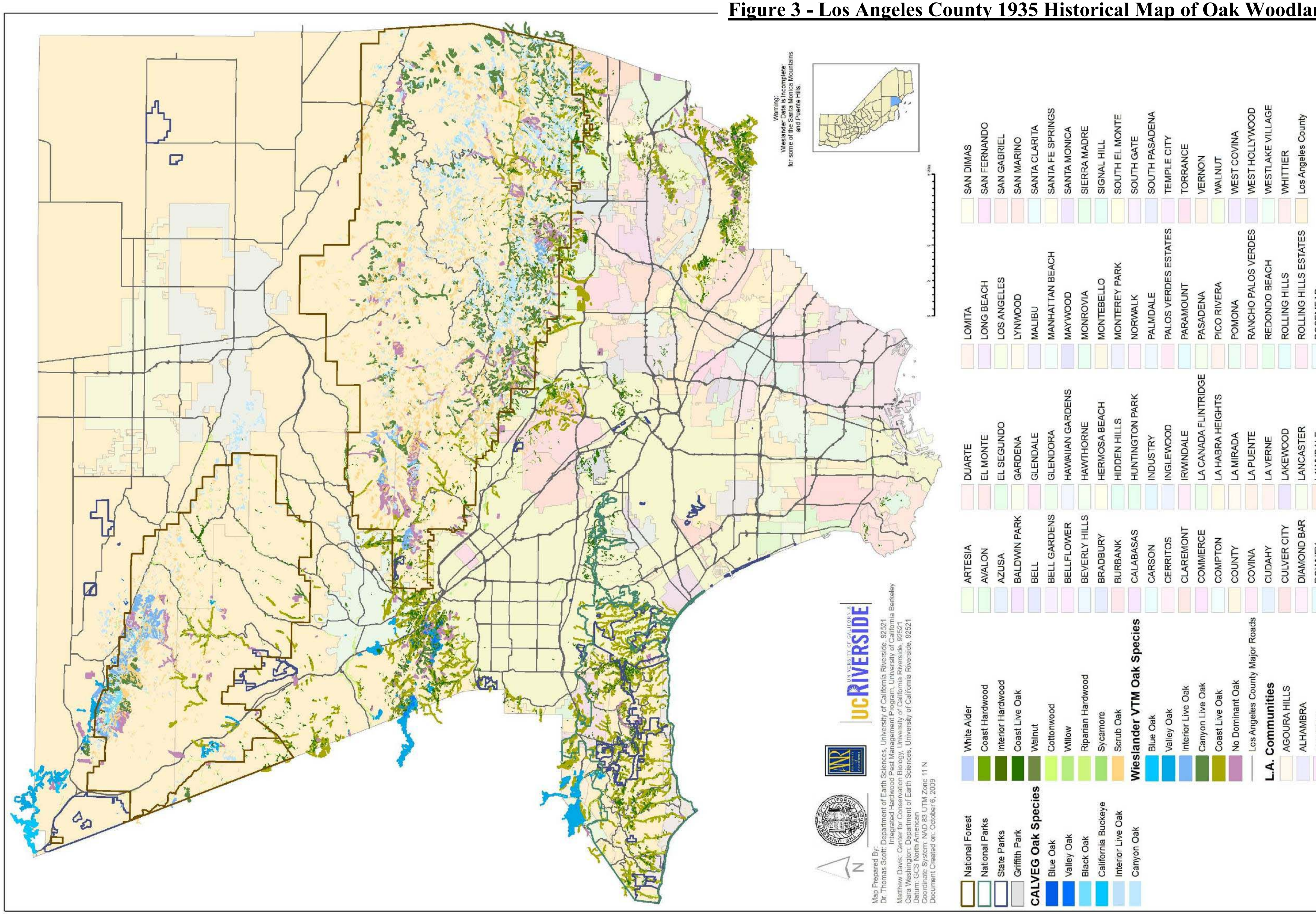
A second growth pattern that began in fragmented areas of the canyons, on steep slopes and along less developed stream corridors was documented. Vegetation maps were generated at that time for most of the state by A. E. Wieslander, a silviculturist with the U.S. Forest Service, with the goal of documenting distribution of vegetation, including oaks, on a scale of 1:1,000,000. The maps, as illustrated on the next page in **Figure 3 - Los Angeles County 1935 Historical Oak Map**, were based on direct sampling of identified plots located along a gradient of vegetation types. Data recorded included tree stand structure, percent cover, understory species, and more. This snapshot of conditions has become the main reference tool for understanding the changes in vegetation since that time. Figure 3 illustrates conditions from 1935 and includes species information overlain on current community areas for reference.

The building boom continued as Los Angeles became the center of pre- and post-World War II manufacturing. Environmental awareness grew along with the developments. By 1970, the California Environmental Quality Act (CEQA) was enacted. This law required full disclosure of any proposed project impacts, required avoidance or reduction of impacts, and most importantly solicited public participation in the planning process.

As awareness of the impacts of losing oak woodlands grew, the County responded by developing one of the first Oak Tree Protection Ordinances in the state in 1982. This well intentioned effort has increased public awareness about the special role oaks have in our ecosystem. However, it has limitations. By focusing on protection of only individual mature oak trees, the ordinance does not promote regeneration/recruitment, ignores intrinsic benefits, and often leads to fragmentation and isolation. Under the Ordinance, there is no cumulative impact assessment required to demonstrate how the loss of individual trees impacts the whole woodland. Statistics provided later in this document indicate that the OTP Ordinance alone has not been very successful at protecting oak woodland resources in over twenty five years of implementation.

Fenced oak in development site Source: Christy

Figure 3 - Los Angeles County 1935 Historical Map of Oak Woodlands



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The ordinance protects aging trees, not communities. The ordinance also fails to assess benefits provided by oak woodlands in mitigating the effects of fire, flood, erosion, air pollution, water pollution, and loss of species diversity. When oak woodlands are removed, the cost of building the necessary infrastructure to provide a similar level of service once provided by the woodlands is passed on to the community in perpetuity.

Recognizing these issues, the state of California passed the Oak Woodland Conservation Act (2004, SB1334). This law set up a process for voluntary conservation and identified oak woodlands as a significant resource throughout the state. This law also requires Counties to develop an Oak Woodland Conservation Management Plan in order to be eligible for state funds to assist in acquiring oak woodlands for the public trust. Only 15 of the 54 counties statewide had developed plans as of 2008.

In 2007 (revised in 2009), the California Forest Protocol (CFP) was adopted by the California Air Resources Control Board (CARB) and incorporated into the CEQA Initial Study Checklist by the Natural Resources Agency in July 2009. CEQA now requires the analysis and mitigation of potential effects of greenhouse gas emissions related to conversion of oak woodlands. Future CEQA documents must include analysis of how biological carbon emissions will change if oak woodlands are converted to other uses.

All of these laws acknowledge that oak woodlands have intrinsic values that provide quantifiable benefits. These include aesthetic values, public health benefits, recreational values and ecosystem function values.

Valley oak, Santa Clarita valley Source: Ty Garrison

Los Angeles County is in the process of revising and updating the Oak Tree Protection Ordinance and the General Plan. The development of an Oak Woodlands Conservation Management Plan is a complimentary effort to expand public awareness, assist with multi-faceted impact evaluation, and identify specific management strategies related to development of the remaining oak woodlands.

By seriously considering what we want oak woodlands in Los Angeles County to look like in 50 years, we can develop a vision with attainable goals. Expanding our evaluation to view oak woodland management issues from several spatial levels, in the context of past oak woodland distribution and potential future restoration, it will be possible to incorporate a more complete cost-benefit analysis to guide planning decisions.

EXISTING OAK WOODLANDS IN LOS ANGELES COUNTY

The geology, climate, and biogeography of Los Angeles County are exceedingly complex, even by the standards of other counties in California. This complexity is reflected in the broad array of oak species (17) in the County, and the even more complex range of conditions where these species occur. County lands range from sea level to 10,000 feet; receive from five (5) to 50 inches of precipitation/year, and; encompass almost all the biomes found in the United States – from coast to mountain to desert. Hence, the range of management options needed to conserve oaks in Los Angeles County must be both flexible and broad to account for the wide range of conditions and idiosyncrasies of the County's oak woodlands.

California oaks often are associated with intermediate elevations (2000 to 5000 feet) and mild conditions (>15 inches of precipitation/year, below the elevation of snow). However, oaks in Los Angeles County have adaptations that allow them to exist along the desert margins (**Palmer's Oak**), at high elevations (**Canyon Live Oak**), and dry coastal valleys (**Coast Live Oak**). The Transverse Ranges, which cross Los Angeles County, form a major break in the biogeography of the California. **Valley, Blue**, and **Oregon Oaks** have their southern limits in the County, but **Engelmann** Oak has its northern limit. The **San Gabriel Mountains Leather Oak** is only found in Los Angeles County, and the largest remaining stands of **Island Oaks** occur on the two Channel Islands (Santa Catalina & San Clemente) administered by the County. Detailed descriptions of each of the oak species called out in this section are included in **Appendix 4** of this document.

Hybrid oak leaves *(Q. lobata x Q. john tuckeri)*
Source: Christy Cuba

The *Jepson Manual of Higher Plants of California* (Hickman 1993) recognizes five major physiographic-biologic subdivisions in Los Angeles County. There are two provinces, the Southwestern Region of the California Floristic Province and in the north-east, the Mojave Region of the Desert Province. The Southwestern Region is represented by three sub-regions having distinct topographic, climatic and plant-community characteristics: South Coast (Coastal Basins and Valleys), Peninsula Ranges (Chino and Puente Hills), and the Transverse Ranges. The Transverse Ranges sub-region is divided into two districts representing localized physiographic and biotic variations: the San Gabriel Mountains and the Western Transverse Ranges, the latter including the Santa Monica, Santa Susana and Liebre Mountains (west end of San Gabriel Mts.).

The result of this physical and environmental diversity is high biologic diversity. In addition, a new species has been recently recognized in the county (Roberts 1995) and two hybrids occur not recognized in Jepson (Boyd 1999). Oak communities are similarly diverse, with at least 13 alliances (regional community types) and numerous associations (local community types). The following account provides a summary of the Los Angeles County oaks species and communities identified in various publications and reports. Detailed descriptions of each of the oak species are included in **Appendix 4** of this document.

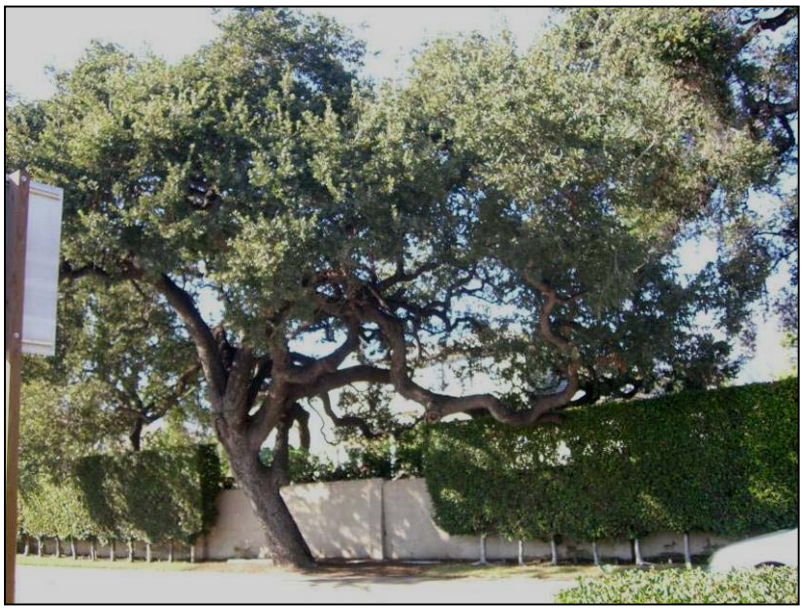
Coast live oak is the dominant species in most lower elevation woodlands, but is co-dominant with **valley oak** in the San Fernando Valley, Santa Clarita Valley, and Santa Monica Mountains. Scrub oak species cover a larger area than either of these two species, but often occur as individual shrubs in chaparral or coastal sage scrub vegetation.

Coast Live Oak Woodland, Calabasas Source: Rosi Dagit

Black, Canyon Live and **Interior Live** oaks are dominant species above 5000 ft. **Valley**, **Engelmann**, **Island**, **San Gabriel Mountain Leather**, and **Nuttall's** oaks are relatively rare and are typically provided special consideration in CEQA evaluation. No oak population in California has been listed under the ESA or California ESA; however, **Nuttall's** oak and several other narrowly distributed species could be petitioned for listing.

Table 1 – Native Oaks of Los Angeles County, lists the native oak species of Los Angeles County, as well as sub-species, and their distributions, general locations, growth forms, habitat types, and CALVEG types. Hybridization is common among species of the same family of oaks. Hybrid species are not included in the table.

Oak woodland areas based on CALVEG information have been mapped for this Plan and are illustrated in **Figure 4 - Los Angeles County Oak Woodlands Area Overlay** on page 57. This figure also includes a 200 foot interface and potential woodland zone. Underlying communities are called out for reference as with the 1935 Wieslander map presented earlier. Due to the scale of the CALVEG layers used to generate this map, it is possible that not all parcels located within the illustrated "Oak Woodland Area" actually support existing oak trees. Individual parcels will be examined further whenever a permit request is reviewed. **Figure 5 - Oak Woodland Canopy Coverage**, on the page 59, illustrates the areas of mapped by species, as created using CALVEG information. As with Figure 4, this figure also includes a 200 foot interface and potential woodland zone and the underlying communities are called out for reference. Smaller scale figures of several communities in the County have also been created based on Figure 5 and are included in **Appendix 11** of this Plan. The areas were selected based on their density of oak woodland areas. They include: the Santa Monica Mountains; Santa Clarita and Antelope Valley Mountains; the San Gabriel Mountains, and; the Puente Hills.



Remnant Engelmann oak on edge of development in foothills of San Gabriel Mts.
Source: Christy Cuba

Table 1 – NATIVE OAKS OF LOS ANGELES COUNTY

RED OAKS (sub-genus Lobatae)

Name	Species & ssp.	Distribution	Locations	Growth Form	Habitats	CALVEG*
Coast Live Oak	*Quercus agrifolia (var.* agrifolia & *oxyadenia)*	Restricted to California Coast Ranges	CR, MTFT, MTS	Single Stem Tree in savannahs or forests	coastal canyons and n-slopes, foothills	CoLO, VO, RMH
Black Oak	*Quercus kelloggii*	Patchy distribution across mountains	MTS	Single Stem Tree in forests; woodlands	>4000ft elv.; gentle slopes	BlaO, MMH
Interior Live Oak	*Quercus wislizeni (*vars. *wislizeni and frutescens*	Widespread across western North America	MTF, MTS	Shrub to Multi-stem Tree in scrub; forests	>18 in precipitation in colder mtns	ILO, CMCh, SMCh, GBMSc

GOLDEN-CUP OAKS (sub-genus) Protobalanus

Name	Species & ssp.	Distribution	Locations	Growth Form	Habitats	CALVEG
Canyon Live Oak	*Quercus chrysolepis*	Widespread across western North America	SGM, LM,	Multi-stem tree, shrub at lower elevations	Steep canyons	CaLO, ILO, MMH
Island Oak	*Quercus tomentella*	Restricted to Channel Islands	ISL	Multi-stem Tree, in scattered stands	Canyon bottoms, north-facing slopes	CoMH
Palmers Oak	*Quercus palmeri* (*Q.dunnii*).	Widespread but patchy distribution across AZ & CA	LM	Shrub to Multi-stem Tree, in scrublands	desert transition	LMMCh, CaB, T/MScO, ScO
Oregon White Oak	*Quercus garryana var. breweri*	Widespread in pacific states	TR	Shrub	>4000ft elv. on gentle slopes	UMMCh, GBMSc
Huckle-berry Oak	*Quercus vaccinifolia*	Widespread in pacific states	MTS	Shrub to Multi-stem Tree in chaparral; forests	>4000ft elv. on gentle slopes	UMMCh, GBMSc

WHITE OAKS - TREE SPECIES (sub-genus Quercus)

Name	Species & ssp.	Distribution	Locations	Growth Form	Habitats	CALVEG
Valley Oak	*Quercus lobata*	Widespread across California	SFV, SMM, SSM	Tall, Single Stemmed Tree in open woodlands	Gentle slopes, alluvial soils	VO, RMH
Blue Oak	*Quercus douglasii*.	Widespread across California	LM, TM	Single Stemmed Tree in woodlands	gentle slopes	BluO
Engel-mann Oak	*Quercus engelmannii* Greene	Endemic to cismontane So. Ca.	SGF	Single Stemmed Tree in dense to open woodlands	rocky substrates	CoLO
Scrub Oak	*Quercus berberidifolia* Liebm	Widespread across California	MTFT	Shrub to small tree in chaparral	valley slopes	CMCh, SMCh
Tucker's Scrub Oak	*Quercus john-tuckeri* Nixon & Muller	Restricted to Transverse & Coast Ranges	DM	Shrub to small tree in chaparral	desert transition	T/MScO, ScO, HDMSc, CaB
Pacific Oak	*Quercus pacifica* Nixon & Muller	Narrowly restricted to Channel Islands	SCAI	Shrub to Multi-stemmed Tree in small stands	Canyon bottoms, north-facing slopes	CoMH
Muller Oak	*Quercus cornelius-mulleri*	Restricted to Transverse & Peninsular Ranges	DM	Shrub to small tree in chaparral Shrub	desert transition	T/MScO, ScO, HDMSc
Leather Leaf Oak	*Quercus durata* var. *gabrielensis*	Endemic to San Gabriel Mts	SGM	Shrub to Multi-stemmed Tree in small stands	desert transition	LMMCh, HDMSc
Arizona Scrub Oak	*Quercus turbinella* Greene	Widespread but patchy distribution in AZ & California	TM, LM	Shrub to Multi-stemmed Tree in small stands	desert transition	LMMCh, HDMSc

***Key to CALVEG Types:**

Sc -	High Desert Mixed Scrub	CMCh -	Ceanothus Mixed Chaparral
LMMCh -	Lower Montane Mixed Chaparral	SMCh -	Southern Mixed Chaparral
T/MScO -	Tucker / Muller Scrub Oak	BluO -	Blue Oak
ScO -	Scrub Oak	VO -	Valley Oak
HDMSc -	High Desert Mixed Scrub	RMH –	Riparian Mixed Hardwood
CoMH -	Coastal Mixed Hardwood	UMMCh -	Upper Montane Mixed Chaparral
CaB- -	California Buckeye	GBMSc -	Great Basin Mixed Scrub
CoLO -	Coast Live Oak	ILO -	Interior Live Oak
CaLO -	Canyon Live Oak	MMH -	Mixed Montane Hardwood

Figure 4 - Los Angeles County Oak Woodlands Area Overlay

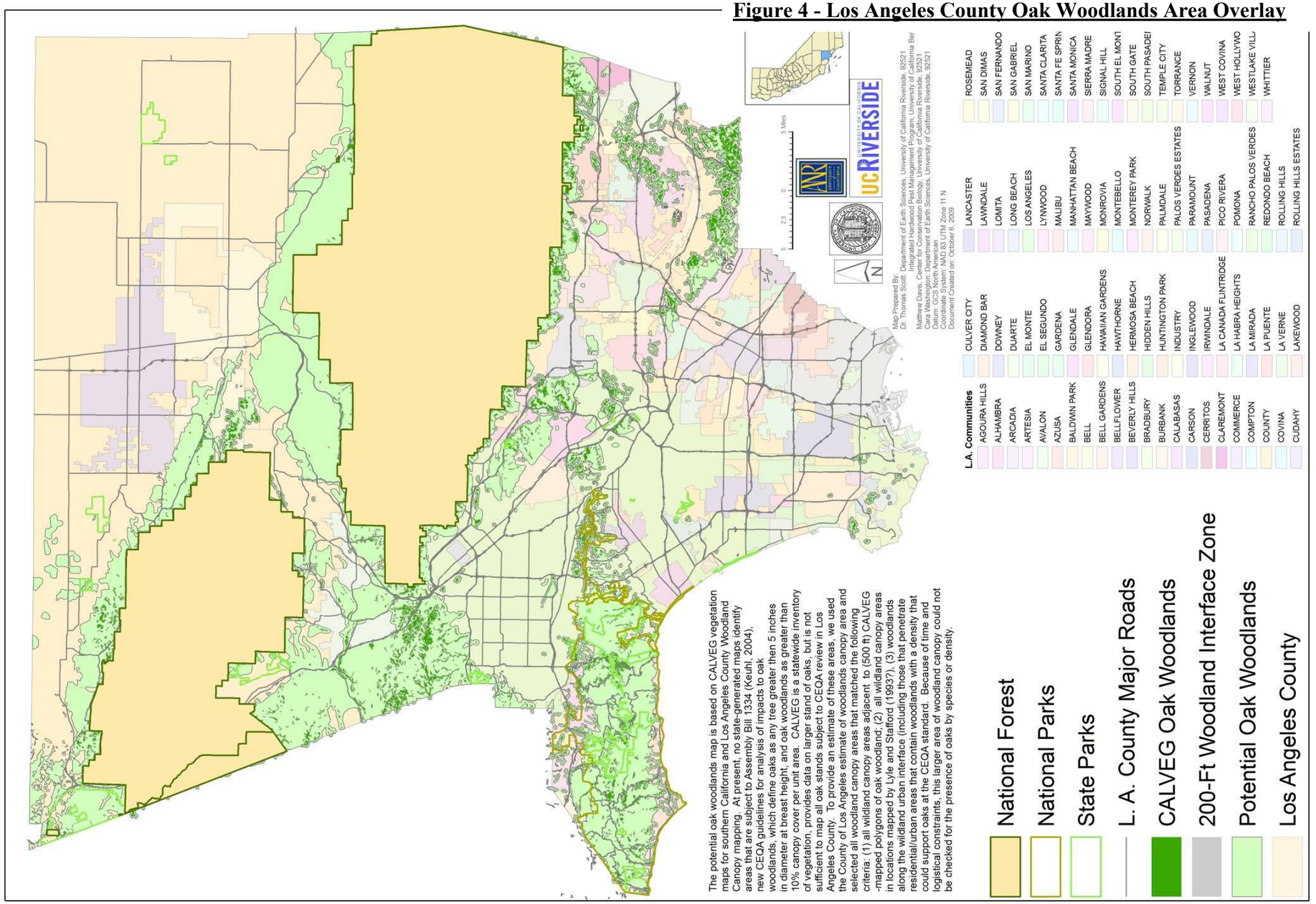


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Figure 5 - Los Angeles County Oak Woodlands Canopy Cover

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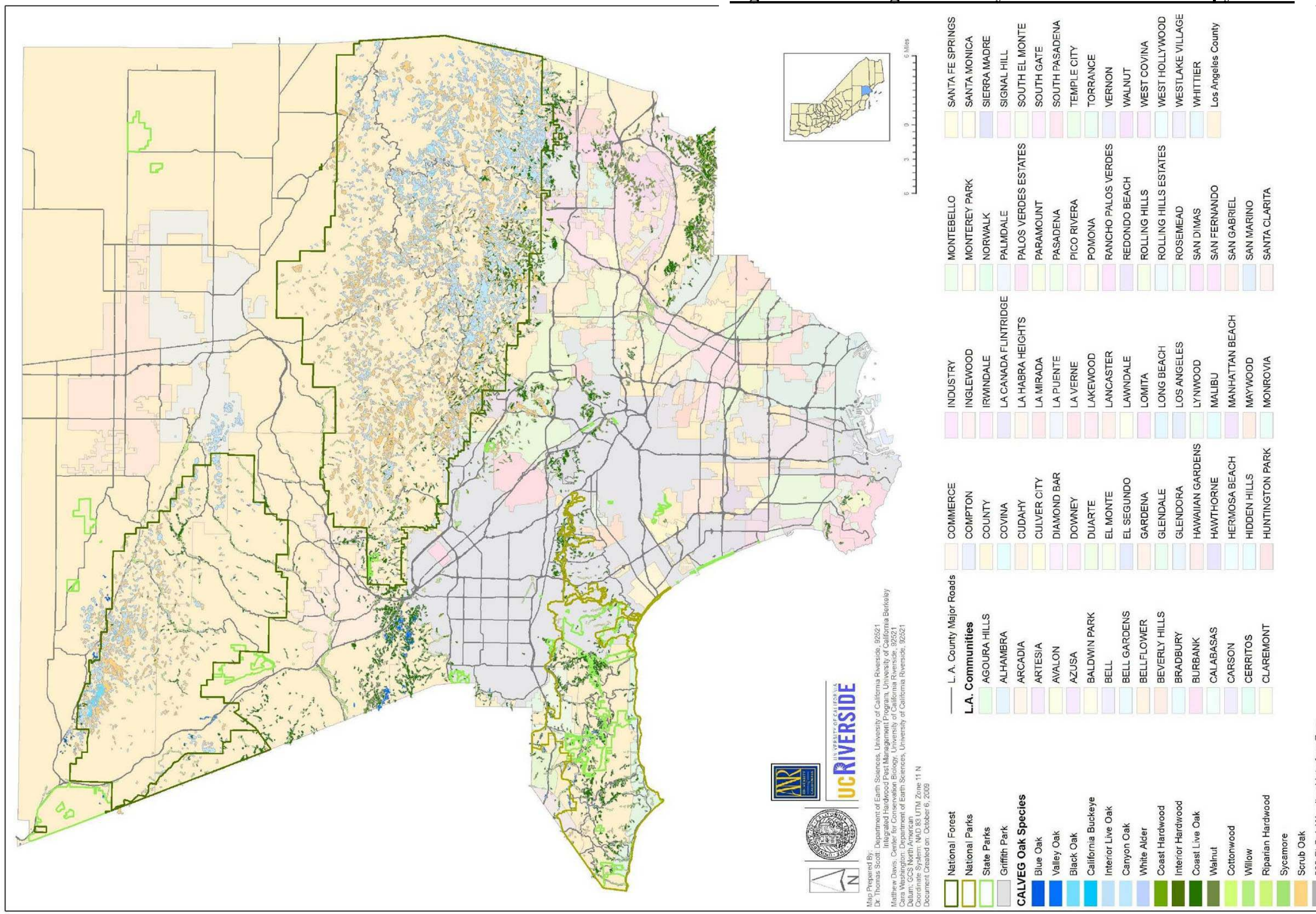

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DEFINITION OF AN OAK AND AN OAK WOODLAND

Oak Woodland

According to the California Department of Fish and Game, "Oak woodlands" are defined as an oak stand with greater than 10 percent canopy cover, or that may have historically supported greater than 10 percent canopy cover. Currently the County uses this definition when evaluating planning impacts in most areas, with the exception of within the Malibu Local Coastal Plan zone.

Separately, an oak stand is defined as a group of two or more trees growing in a contiguous pattern. Spatial relationships vary between oak species and oak woodland types, ranging from the more scattered hillsides of valley oak savannah, to the dense north facing hills with unbroken canopy of coast live oak, to the stands of scrub oak surrounded by chaparral. The variation in stand characteristics reflects the diversity of oak species found in Los Angeles County. Even stands that do not meet the definition of an oak woodland may provide important biotic resources that are worthy of protection. **For the purposes of this document:**

- **Any oak stand consisting of any of the oak associations documented herein that has greater than 10 percent canopy cover over the subject parcel(s) shall be considered an oak woodland.**

- **Any oak stand consisting of any of the oak associations documented herein which can be shown to historically have had a greater than 10 percent canopy cover over the subject parcel(s) shall be considered an oak woodland.**

Using a definition of 10% of the subject parcel provides the quantitative indicator necessary for planners and applicants to easily and definitively determine if an "oak woodland" is or is not on the subject parcel. It provides certainty, without substantially threatening the areas with canopy of 9.9% or less on the subject parcel because these trees would be covered by the Oak Tree Protection Ordinance or CEQA review. The Oak Tree Protection Ordinance requires applicants to include oak trees within 200 feet of the proposed development. While the ordinance currently focuses on the individual trees within 200 feet, not overall ecological function, this could change with the revision to the ordinance currently underway. Under CEQA, the cumulative biological impacts analysis

requires an applicant to analyze the overall impacts of a project in light of the resource as a whole in the surrounding area. This would capture the woodland resources on adjacent parcels where the core oak woodland has more than 10% canopy coverage.

When could a single oak tree considered part of an oak woodland?

This depends on proximity and species. Valley oaks are commonly distributed widely with native or exotic grasslands interspersed between trees. However, the sphere of influence of the individual tree frequently extends beyond its protected zone in that dispersal of acorns and recruitment of seedlings intermingle with the grassland or chaparral surrounding. Therefore, mature trees that are 200 feet apart may be considered part of functional woodland because they have a natural distribution with fully functional woodland processes. This is in contrast to a single oak tree isolated within a parking lot, or other developed area, with no potential for natural replacement and no linkage to normal woodland process and species interactions.

DEFINING THE OAK WOODLANDS FOR PLANNING PURPOSES

There is a wide variation of oak woodland types within Los Angeles County. Therefore, qualitative standards, such as associated understory conditions, including site topography, soil genesis, hydrology, presence of oak woodland associated flora and fauna, along with a description of the stand characteristics, such as number of trees, size, health, vigor, will be used to provide a descriptive assessment, or definition, of the present condition of the oak woodland on a given site. The ecologic and aesthetic values of the oak woodland depend on the sum of activities of all members (including humans) and forces acting on the development, stability or even the demise of the oak woodland.

Oak Woodland Impact Decision Matrix

Because oak woodlands exist both in a temporal sense (present versus past distribution, potential for restoration) and a spatial sense (contiguous to fragmented, single tree, site and watershed), the plan recommends adopting the definitions provided by the ***Oak Woodland Impact Decision Matrix*** (Guisti et al 2008) to identify **"Intact", "Moderately Degraded"** or **"Severely Degraded"** oak woodlands. These tiers of existing conditions provide property owners and planners guidelines for developing suitable strategies for developing an appropriate evaluation of proposed impacts, or strategies for potential conservation and restoration.

While specific thresholds of significance are not developed by this document, proposed land development projects that may encroach upon or otherwise affect oak woodlands should be evaluated, in part, based on whether the proposed project would degrade the oak woodland to the point that it would cause the woodland to be classified in a more degraded tier than its existing condition. Similarly, efforts to conserve or restore oak woodlands as mitigation for project impacts should attempt to restore or conserve oak woodlands that are at least as intact as those being impacted by the proposed project.

Native understory & oak woodland, Gorman
Source: Ty Garrison

As discussed in the ***Oak Woodland Impact Decision Matrix***, these conditions are defined as follows:

Intact Woodlands

The site is currently in a "wild" state where all ecological functions such as groundwater infiltration, shade, habitat, nutrient cycling, carbon sequestration, wind/noise/dust abatement, and the stand is self-sustaining and regenerating. Given that the majority of even the most intact oak woodlands in Los Angeles County have understory grasslands dominated by invasive exotic grasses and forbs, and that fire exclusion or frequency has altered many native oak woodlands, the designation of **Intact** needs to be somewhat flexible. The designation of **Intact** refers mainly to sites where oak woodlands support associated flora and fauna and are free from destructive land practices that limit long-term persistence.

If a site is defined as **Intact,** any proposed projects that would alter the oak woodland should receive the highest level of scrutiny. Project alternatives that would avoid this alteration should be fully explored and given first consideration.

Non-native plants & fill material near shrub oak woodlands on urban interface, Santa Clarita
Source: Christy Cuba

Moderately Degraded

Even though the site has been altered, oak woodlands persist and retain some of their functions. Natural regeneration is possible,

wildlife use still occurs, and some level of ecosystem services are still present. Examples of moderately degraded oak woodlands in Los Angeles include golf courses intermixed with fragmented oak woodlands, many of the subdivisions and urban-wildland interface areas found in the Santa Monica Mountains, Santa Clarita Valley, along the foothills of the San Gabriel Mountains and throughout the Puente Hills. The majority of oak woodlands in the County fall within this category.

If a site is defined as **Moderately Degraded**, any proposed project needs to be reviewed within the context of preventing further ecosystem function losses. This could include reduction of project scale, adjusting project footprint to reduce impacts, identifying opportunities to preserve connectivity, increase groundwater retention and restore habitat.

Severely Degraded

These sites have been drastically altered from the natural condition to accommodate residential, commercial or industrial uses, and oak woodlands remain in scattered locations. Natural regeneration is not possible. Soil is compacted, contaminated or paved. Wildlife habitat is limited and associated understory vegetation has been replaced by managed non-native landscaping.

Remnant oaks in commercial site adjacent to pockets of other oak trees Source: Christy Cuba

A **Severely Degraded** site should be reviewed within the context of adjacency to other oak woodland stands, potential for restoration and the potential to restore connectivity and ecosystem functions. Examples of severely degraded oak woodlands include small clusters of oaks within or surrounding parking lots, isolated small stands in parks or open spaces surrounded by urban development, or woodlands remaining along freeway corridors. A **Severely Degraded** site may be a good choice for a mitigation area that could be restored.

Special Circumstances Regarding Oak Woodland Evaluation

Because they are locally rare, isolated Valley and Engelmann Oaks warrant special consideration, even if located within **Severely Degraded** oak woodland. These situations need to be considered in light of potential for restoration and distribution within Los Angeles County.

As mentioned above, the (MALIBU) LOCAL COASTAL PLAN contains specific policies and definitions that also need to be applied within the coastal zone. The LOCAL COASTAL PLAN is currently under revision, so the policies included below are subject to change as that document evolves.

At present, "Significant oak woodlands" are designated only in the (MALIBU) LOCAL COASTAL PLAN, (LCP) which guides planning decisions in the unincorporated Coastal Zone of the Santa Monica Mountains. A closed canopy has generally been understood to be an oak woodland in the Coastal Zone, but this is not codified, and savannahs are equally noted as being significant.

Many of the riparian areas with oak woodland in the Santa Monica Mountains are designated as part of ESHAs (Environmentally Sensitive Habitat Areas).

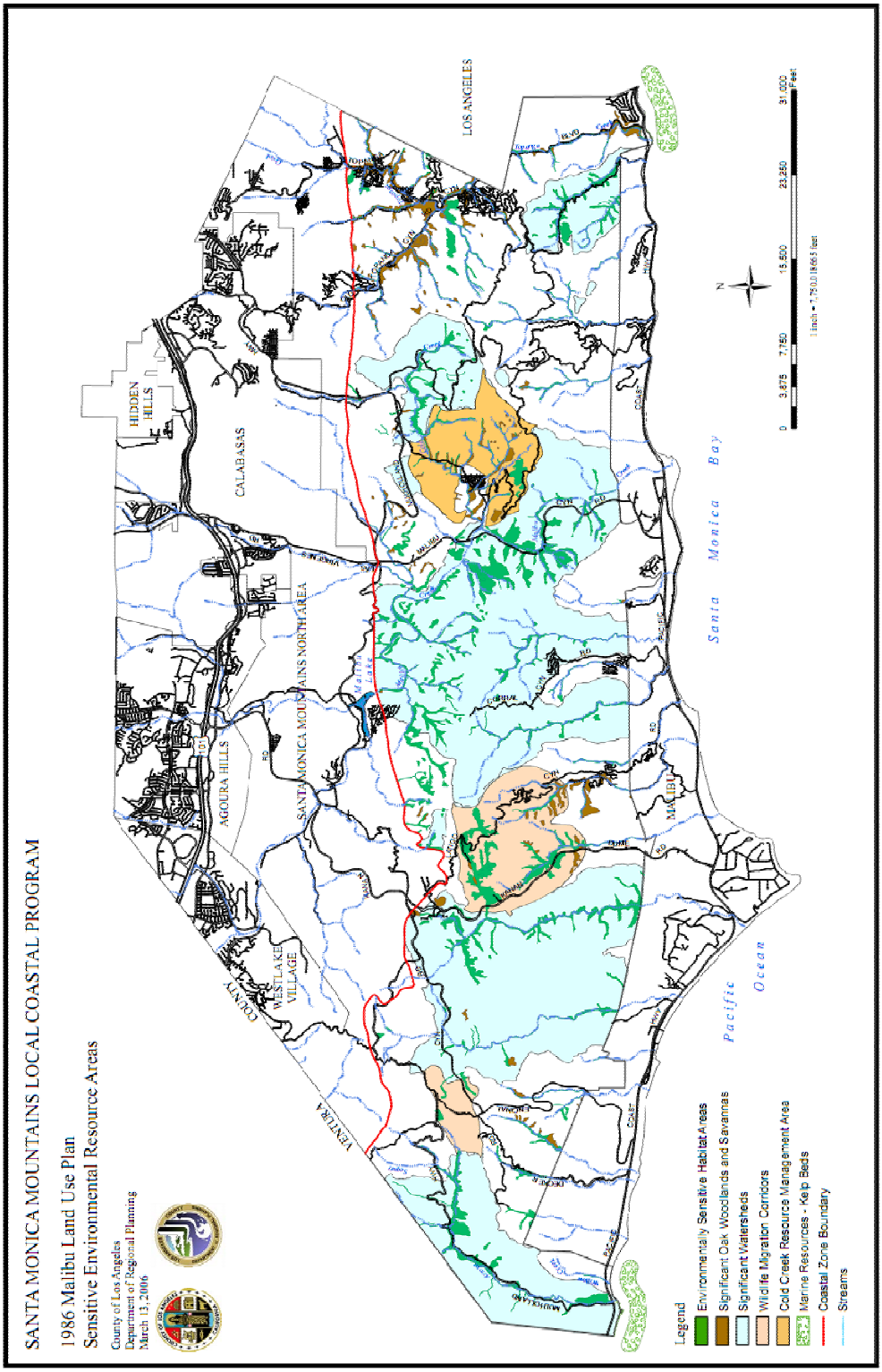
Young of the year steelhead trout dependent on oak riparian cover in the Santa Monica Mts.
Source: Rosi Dagit

Exceptional undisturbed oak woodlands and savannahs are noted as important components of many SERAs (Sensitive Environmental Resource Areas) that are within "Significant Watersheds," also shown in Figure 6 of the Malibu Local Coastal Plan, herein represented by **Figure 6 – 1986 Malibu LUP SERAs**, on the next page.

The Los Angeles County Oak Tree Protection Ordinance protects all trees in the genus *Quercus* greater than eight (8) inches in diameter at breast height (dbh; 4 ½ feet above natural grade). The California Forest Act SB 1334 (Kuehl) protects all oaks over five (5) inches in dbh. California AB32 addresses carbon sequestration and has been interpreted in court decisions as applying to oak woodland trees three (3) inches or more in diameter at breast height (DBH). Scrub and intermediate-sized oak species (see **Table 1**) typically grow to sizes that bring them under the Oak Tree Protection Act, particularly in areas with high precipitation, such as coastal foothills and mountains.

All of these definitions could come into play when evaluating site-specific potential impacts to Oak Woodlands within Los Angeles County.

Figure 6 - 1986 Malibu LUP - SERAs



OAK COMMUNITIES OCCURRING IN LOS ANGELES COUNTY

The concept of an ecological or natural plant community, defined by Oosting in "*The Study of Plant Communities*" (1948) as "…an aggregation of living organisms having mutual relationships among themselves and to the environment", takes into account both biological composition and the complex interactions that occur among species and their physical environment. Community processes, however, are not readily apparent or even fully understood. As a practical matter, both lay and professional observers generally rely on a more intuitive floristic definition such as that provided by Munz and Keck in "*A California Flora*" (1959). In this work, a plant community is "…each regional element of the vegetation that is characterized by the presence of certain dominant species." While based on floristic composition this definition nevertheless implicitly takes into account the environmental conditions and biotic processes that cause and result from recurrent plant assemblages.

Canyon oak, coast live oak, Californa bay, big leaf maple & white alder woodland, Monrovia
Source: Christy Cuba

This floristic definition of community is in wide use today, expressed as the Alliance (Series) and Association concept adopted by the National Vegetation Classification Standard (Jennings et al. 1996), the California Department of Fish and Game, and the California Native Plant Society (Sawyer and Keeler-Wolf 1995). Under this system, an alliance is the generic unit of vegetation defined by the dominant and characteristic plant species in the layer of vegetation with the greatest plant cover. Alliances are often regional in extent and are named for a single dominant or less frequently, two equally codominant species. Associations are the fundamental vegetation units, localized to particular geographic subregions and clearly associated with certain environmental settings. Similar associations are grouped into alliances based on patterns of plant species dominance, similar to the way species are grouped into genera. Associations are defined by a dominant and one or more codominant or characteristic species. The following Los Angeles County oak community listing is an attempt to document and illustrate the diversity of oak communities found in Los Angeles County based on a review of available literature.

Vegetation alliances are those recognized by the California Department of Fish and Game (2007). The alliances and associations in the discussions below are drawn from local flora and vegetation descriptions (Boyd 1999, Hanes 1976, Keeler-Wolf & Evens 2006, Miles & Goudey 1997, Mullally 1997, Roberts 1996). These sources collectively provide near complete geographic coverage of oak habitats in mainland Los Angeles County. However, there are undoubtedly additional community associations not included in the tables. Also, occurrences of associations may not be limited to only those locations for which a reference is cited. Island community types are not included in this listing. The Liebre Mountains are not commonly identified on road maps, but are identified by biologists as the western segment of the San Gabriel Mountains.

Valley and Foothill Oak Woodlands

Valley & Coast live oak woodland, Calabasas
Source: Rosi Dagit

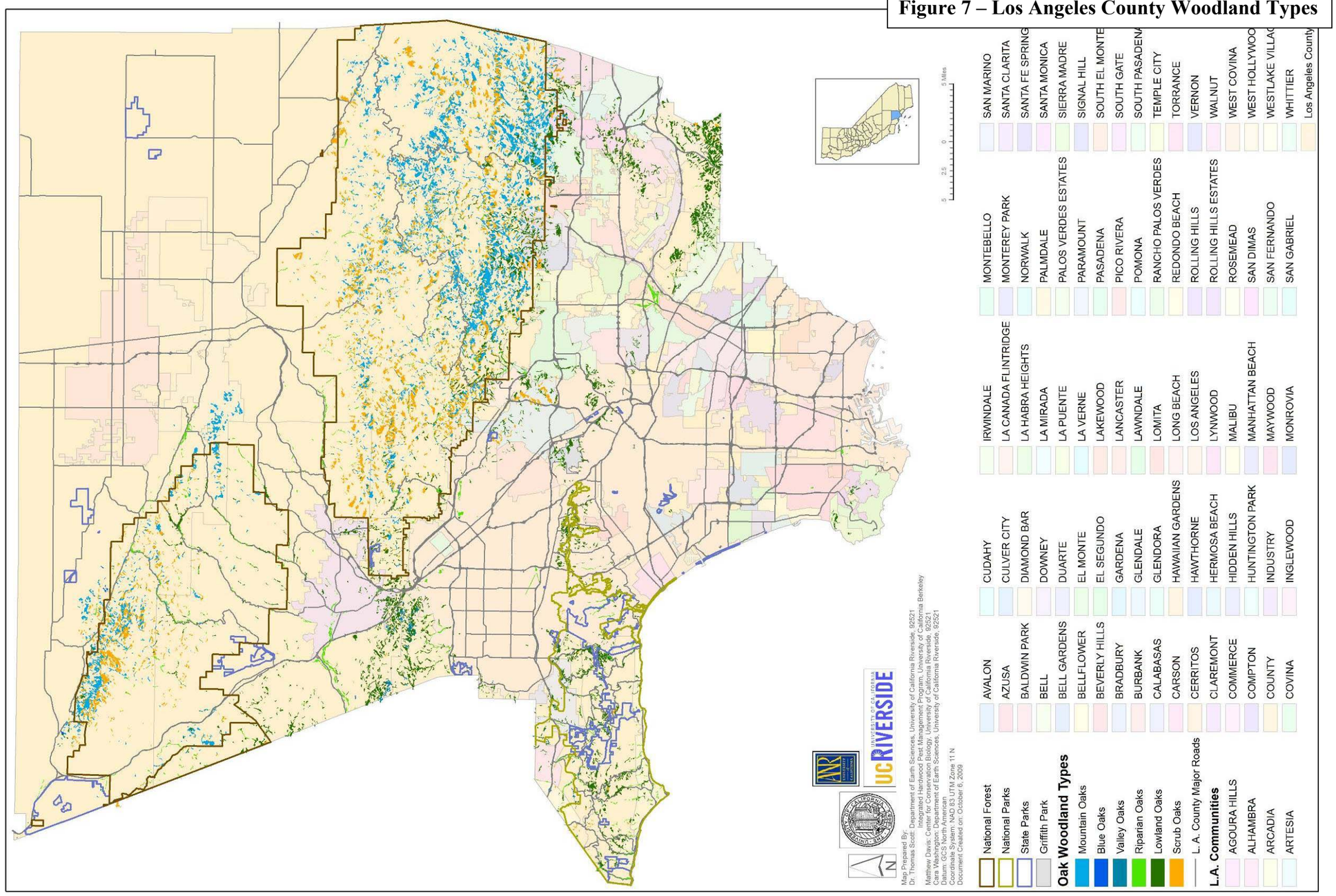
These low elevation (below 3,600 feet) oak communities are those most commonly encountered by Los Angeles County residents. They are common on north slopes, valley bottoms and along streams. Alliances include the ubiquitous Coast Live Oak Woodland, mixed with Engelmann oak in the San Gabriel foothills, and Valley Oak Woodland found in the western County. Communities occur as two distinct types. In valleys and on rolling hills they are generally open, often appearing as savannah. The understory is frequently grass, less commonly coastal sage and chaparral. In canyons and along streams communities occur as dense closed-canopy stands, where coast live oak and mixed oak riparian forests may develop (Stephenson & Calcarone 1999).

Table 2 – Alliances & Distribution of Valley & Canyon Oaks

Dominant Oak Species	Number of Alliances	Geographic Distribution
Coast Live Oak	20	Throughout LA County
Valley Oak	5	Liebre, Santa Monica & Santa Susanna Mountains
Blue Oak	1	Liebre Mountains

Figure 7 - Los Angeles County Woodland Types is provided on the next page to illustrate the mapped locations on oak woodland types in Los Angeles County.

Figure 7 – Los Angeles County Woodland Types



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Montane Oak Woodlands

These high elevation (above 3000 feet) oak woodland communities are of limited distribution in Los Angeles County. They occur only in the upper elevations of the San Gabriel and Liebre Mountains. Montane oak stands are often mixed with conifers, and oaks often occur as associates within a conifer alliance. Live oaks can be shrub-like in uplands, but also occur as tall, spreading trees along streams (Stephenson and Calcarone 1999).

Steller's Jay Source: Ty Garrison

Table 3 - Alliances & Distribution of Montane Oak Woodlands

Dominant Oak Species	Number of Alliances	Geographic Distribution
Black Oak	1	Liebre Mountains, Wrightwood
Canyon Live Oak	1	Liebre, Santa Susanna (?) and San Gabriel Mountains
Interior Live Oak	1	San Gabriel Mountains
Mixed Oak Woodland	1	Liebre Mountains, Wrightwood

Scrub Oak Chaparral

Scrub oak is an important, widespread component of chaparral, with communities occurring from sea-level up to 5000 feet. It forms dense closed canopy stands, often in association with other chaparral shrub species. Some scrub oaks can occasionally take the form of a small tree.

Closed-canopy scrub oak chaparral, Santa Clarita
Source: Christy Cuba

Table 4 - Alliances & Distribution of Scrub Oak Chaparral		
Dominant Oak Species	**Number of Alliances**	**Geographic Distribution**
Shrub Oak	4	Throughout LA County
Shrub Oak - Chamise	1	Liebre and Santa Monica Mountains
Shrub Oak – Birchleaf Mountain Mahogany	1	Liebre and Santa Monica Mountains
Shrub Oak – Chaparral Whitethorn	1	Liebre and San Gabriel Mountains

Montane Live Oak Scrub

These oak communities generally occur above 4,000 feet (interior live oak occurs above 2,000 feet in the Santa Monica Mountains). They are dominated by the shrub forms of canyon and interior live oak, although tree forms may sometimes occur. They are associated with higher elevation chaparral species.

Canyon live oak acorns
Source: Christy Cuba

Table 5 - Alliances & Distribution of Montane Live Oak Scrub		
Dominant Oak Species	**Number of Alliances**	**Geographic Distribution**
Canyon Live Oak Shrubland	1	Liebre Mountains
Interior Live Oak Shrubland	3	Liebre, Santa Monica and Santa Susanna Mountains

Other Vegetation Types Containing Oaks

Oaks are a ubiquitous element in plant communities of Los Angeles County, where they can occur as individuals or small stands in alliances otherwise dominated by other species. Coast live oaks in particular occur in many chaparral types and are common in riparian areas where it forms associations

within sycamore, willows and California bay alliances, such as the Sycamore – Coast Live Oak Association of the Santa Monica and Santa Susana Mountains.

Table 6 below summarizes the Acreage of Vegetation with Oak Species in Los Angeles County. Vegetation types are listed by acreage on private lands and public lands, based on USFS PSW Vegetation Mapping Program (http://www.fs.fed.us/r5/rsl/projects/mapping/) for the southwest ecoregion of California. Most areas of Los Angeles were mapped since 2007.

Table 6 - Acreage of Vegetation with Oak Species in Los Angeles County

Woodland (OW) Type	San Gabriel Foothills & urban islands of oak woodlands	Santa Clarita and San Fernando Valleys	Santa Monica Mountains	Desert Transition	Private woodland	Public woodland	Total Acreage for Type
Coast Live Oak	13662	9380	4073	341	27456	16494	43950
Valley Oak	2938	919	134		3991	1510	5501
Black Oak						1430	1430
Canyon Live Oak	1546	90		1186	2822	43305	46127
Engelmann Oak						835	835
Blue Oak				95	95	31	127
Interior Live Oak				73	73	10	83
Coastal Hardwoods	2544	153	300	0	2297	4053	7051
Interior Hardwoods	493	33		105	631	14626	15258
Riparian Woodlands	1398	3365	611	599	5972	6604	12576
Total Ac. all Woodlands Types w/ Oaks	22581	13940	5118	2399	44038	88898	132936
OW in Lowlands & foothills	16599	10299	4208	341	31447	18880	50327
Mountain OW and Forests	1546	90	0	1186	2822	44735	47557
Scrub Oak Vegetation type	6574	304	173	1119	8170	68725	76895

Total acreage is similar to Gaman and Firman (2006) but different survey techniques and more recent analyses yield slightly different estimates of acreage among woodland types.

The Oak Woodlands Habitat Conservation Strategic Alliance's (Alliance) estimate of oak woodland areas in Los Angeles County (using USFS PSW Vegetation Mapping data) is similar to Gaman and Firman (2006) but different survey techniques and more recent analyses yield slightly different estimates of acreage among woodland types. Gaman and Firman used the Land Cover Mapping and Monitoring Program (California Department of Forestry and US Forest Service; http://frap.cdf.ca.gov/projects/land_cover/index.html); and provided a statewide assessment of oak woodlands and forests. As such, they did not consider oak trees found in vegetation where they were sub-dominant, including riparian, cottonwood, alder, sycamore or pinon-juniper woodlands (see LCMMP vegetation descriptions); nor did they consider scrub oak vegetations, which are included in this report because scrub oak species grow large enough to be included in the current oak ordinance and CEQA amendments (>5 inch DBH). There are also differences in individual woodland boundaries and classification types, with only about a 46% level of overlap.

Most important, both the Gaman and Firman (LCMMP) and the USFS (CALVEG) estimates have limitations due minimum polygon size used in the mapping process, and as a result do not include small stands of oaks that are covered under the Oak Woodland Protection Act CEQA statute (SB 242 1334). To resolve the issue of oak woodlands that were not mapped in either the LCMMP or CALVEG but fall under CEQA (and the LA County Oak Ordinance), we created a map of *potential* oak woodlands using County of Los Angeles LYDAR generated imagery for tree canopy areas within County administered lands. Translating this imagery into specific oak woodland types was beyond scope of the current study, so all tree canopy areas within 500 ft of CALVEG oak woodlands were considered to be potential oak woodlands with the exception of horticultural trees in landscaped settings. This produced an inclusive estimate of potential oak woodland areas, but provides the most realistic map of the areas in Los Angeles County potentially affected by the new CEQA guidelines for analyses of impacts to oak woodlands. The potential area could be refined in the future to eliminate canopies of non-oak species.

OAK WOODLAND OWNERSHIP PATTERNS

Gaman and Firman (2006) estimated that Los Angeles contains about 145,000 acres of oak woodland and forest, assigning about three quarters of these areas to public ownership (c. 110,000 acres) and one quarter to private ownership (30,000 acres). They suggested that almost all of the oak woodlands on private lands have been developed, stating that "There are a few thousand acres of undeveloped private oak woodland [in Los Angeles County], but most of them are likely to be developed by 2040." Their analysis was based on data designed to monitor large-scale change in vegetation, rather than an analyses of parcels in oak woodland areas of Los Angeles. The Alliance's estimates for oak woodlands in private ownership are higher (44,000 acres, 33% of total woodlands). The discrepancy occurs because there is no current map of oak woodland preserves, easements, parks and other conservation measures for Los Angeles.

Topanga creek **Source: Rosi Dagit**

Oak woodlands with the greatest probability of conversion tend to occur in linear stands or small patches embedded in other vegetation types. These interface woodlands often cover only a portion of larger parcels, making it somewhat difficult to reconstruct the actual acreage of woodland converted into housing and other land-uses. However it is relatively simple to estimate the rate of construction and the extent of remaining parcels with oak woodlands (about 250,000 acres). At the present rate of conversion, remaining private parcels with oak woodlands will be built out by 2040. Approximately 56,000 parcels between 0.5 and 160 acres are within or adjacent to oak woodlands throughout the county. Approximately half of the privately owned acres are within the Santa Monica Mountains area, even though this areas has less of the over woodland acreage in the region. This dichotomy points out the dispersed nature of the oak resource in many urbanizing areas.

Finally, Gaman and Firman (2006) suggest that only about 20% of the oak woodlands in the County had been lost, but this figure includes forests and woodlands on the National Forests. Most of this acreage is mountain woodland rather than the lowland woodlands that provide the greatest values to

Los Angeles residents. Converting Gaman and Firman's 2006 estimate of 20% loss of woodlands translates into about 60% loss of oak woodlands from private lands in the County. With the exception of the Santa Monica Mountains, woodlands on public's lands are relatively remote and not considered to be integral parts of Los Angeles communities. By coarse estimate, about 30% of the oak woodlands in Los Angeles were lost between 1850 and 1982, 35% has been lost in the past 27 years, and if current trends continues without management, the last 35% could be lost in the next 30 years.

Distribution of Oak Woodlands Among Parcels in Los Angeles County

Approximately 56,000 parcels between 0.5 and 160 acres are within or adjacent to oak woodlands throughout the County. Approximately half of the privately owned acres are within the Santa Monica Mountains area. Los Angeles County has the majority of oak woodlands in the Southern California region, with oaks representing over 80% of all trees (Gaman and Firman 2006). Unfortunately, Los Angeles County has already lost over 30% of its woodlands, and that remaining in private ownership are expected to be developed by 2040. **Table 7 - Percent Distribution of Oak Woodlands in L.A. County,** on the next page summarizes the existing, known distribution of oak woodlands in Los Angeles County.

Table 7 – Percent Distribution of Oak Woodlands In Los Angeles County						
	Public Lands	Private Lands				Percent
Woodland Types Including Oaks	All Types	Foothills and Lowlands	Santa Monica	Valleys	Desert	Total %
Canyon Live Oak	30.8	1.2	0.0	0.1	0.9	32.9
Coast Live Oak	5.0	5.9	4.6	4.6	0.3	20.3
Walnut Woodland	0.6	2.1	0.2	0.7	0.0	3.6
Interior Hardwoods	3.2	0.1	0.0	0.0	0.1	3.4
Coastal hardwoods	0.9	1.7	0.3	0.1	0.0	3.1
Valley Oak	0.2	0.0	0.1	0.6	0.1	1.0
Black Oak	1.0	0.0	0.0	0.0	0.0	1.0
Blue oak	0.0	0.0	0.0	0.0	0.1	0.1
Interior live oak	0.0	0.0	0.0	0.0	0.1	0.1
Riparian Woodland	1.6	0.4	0.6	0.9	0.1	3.6
Cottonwood Woodland	0.4	0.0	0.0	0.3	0.3	1.0
Sycamore Woodland	0.4	0.1	0.2	0.0	0.0	0.7
Scrub oaks	25.0	1.9	0.2	0.2	0.9	28.2
Grand Total (%)	69.5	13.7	6.3	7.6	2.8	100.0

While much of the oak woodland is in public ownership within the Angeles National Forest, National and State Parks, the edge effects related to fragmentation and lack of coordinated long-term stewardship planning puts these protected areas at risk, as well. The opportunities to reconnect isolated woodlands, encourage regeneration and expansion back into the historic range, and voluntary conservation in present oak woodlands are all natural outgrowths of this planning project.

Table 8 - Size of Parcels Within or Adjacent to Oak Woodlands in L.A. County summarizes the

size of parcels within or adjacent to oak woodlands in the County that **may** represent opportunities for conservation or preservation.

TABLE 8 - SIZE OF PARCELS WITHIN OR ADJACENT TO OAK WOODLANDS IN LA COUNTY

Parcel Size	Number of Parcels	Number of Acres
0.5-1 acre	15,000	11,000
1-5 acres	24,000	58,000
5-20 acres	12,000	95,000
20-80 acres	3,500	130,000
>80 acres	900	162,000
TOTAL	**55,400**	**456,000**

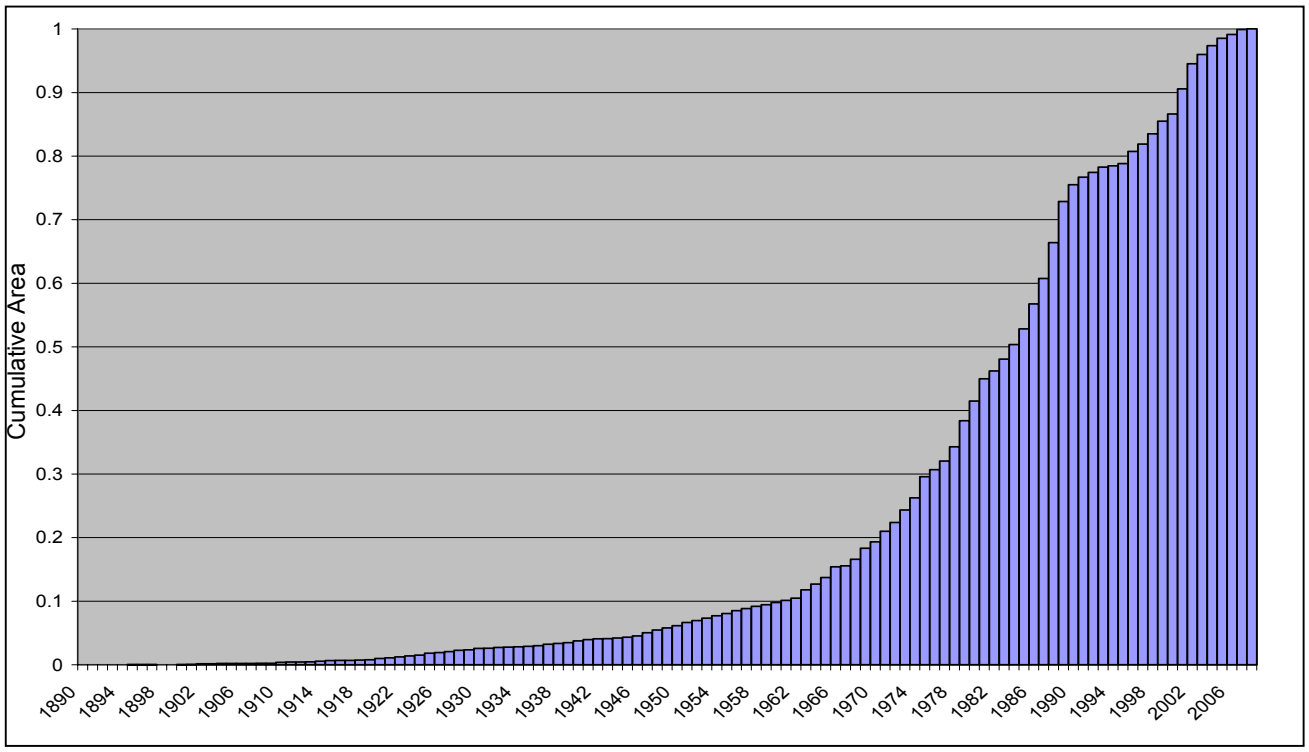
Interaction Between Development and Oak Woodlands

Retained oaks in development site
Source: Rosi Dagit

Conservation of existing oak woodlands within Los Angeles County is a challenge due to a number of factors that threaten their continued health and longevity. These factors include: land conversion resulting from urban and suburban development; road and infrastructure expansion; low oak seedling recruitment to replace the existing old oaks (also known as a lack of regeneration); increasingly limited access to groundwater in some areas that increases the mortality of both young and old oaks; and clearing for fire protection around developed areas. Identification of existing oak woodlands through mapping overlays and a monitoring program in Los Angeles County would detail the specific regional threats to these habitats.

Exhibit 1 below illustrates the cumulative increase in the parcels with homes (by acreage, not number) in oak woodland areas, graphed by the year built (using assessor file data). This figure shows the cumulative rate of home construction in oak woodlands since 1890 in Los Angeles County

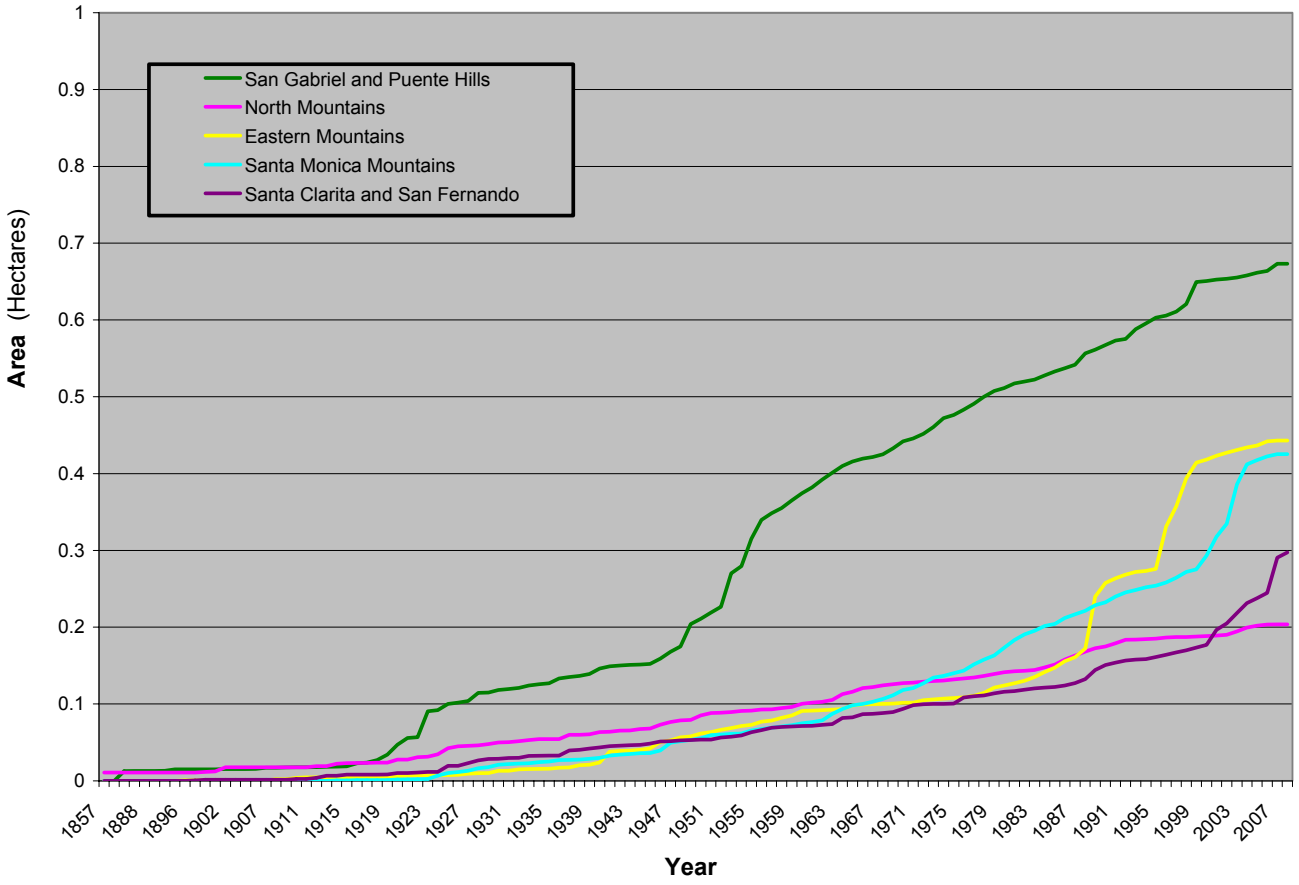
Exhibit 1 – Increase in Developed Parcels (cities and unincorporated areas) of Los Angeles County Since 1890 (in acres)



Source: L.A. County Parcel Data. Graph prepared by Dr. Tom Scott

Exhibit 2 illustrates the cumulative area (in hectares) of parcels with homes built since 1890 in five (5) regions of oak woodlands in Los Angeles County: San Gabriel Valley and Puente Hills; northern mountains, eastern-central mountains, Santa Monica Mountains; and the San Fernando and Santa Clarita valleys. With the exception of the San Gabriel Valley, about 50% to 75% of land development in unincorporated oak woodlands has occurred since the Los Angeles County Oak Tree Protection Ordinance was adopted in 1982.

Exhibit 2 – Increase of developed parcels in regions of Unincorporated Los Angeles County since 1890 (proportions represent the developed parcel area with oak woodlands relative to all private parcel areas with oak woodlands)



Source: L.A. County Parcel Data. Graph prepared by Dr. Tom Scott

Land Conversion

Urban and rural residential developments are responsible for the majority of oak woodlands acreage conversion in Los Angeles County and elsewhere. The majority of the remaining oak woodlands within the county are found within unincorporated areas, many located on the fringes of the incorporated cities. Most of the landscape within the cities of Los Angeles County has been developed. As a consequence, it is the unincorporated areas that are most often the focus for future growth by developers. Through the adoption of an Oak Woodlands Conservation Management Plan,

the County will develop a methodology to calculate an economic value for the loss of oak woodlands and to preserve the currently remaining oak woodlands.

The Los Angeles County Oak Tree Ordinance was established to recognize oak trees as significant historical, aesthetic, and ecological resources. The goal of that ordinance was to create favorable conditions for the preservation and propagation of this unique and threatened plant heritage. The Los Angeles County Oak Tree Ordinance applies to all unincorporated areas of the County.

Under the existing Los Angeles County Oak Tree Ordinance, a person shall not cut, destroy, remove, relocate, inflict damage, or encroach into the protected zone of any tree of the oak tree genus, which is eight (8) or more inches in diameter four and one-half feet above mean natural grade or in the case of oaks with multiple trunks, a combined diameter of twelve inches or more of the two largest trunks, without first obtaining a permit. The County's Oak Tree Protection Ordinance protects and requires compensation for loss of individual oak trees, but does not incorporate consideration the value of oak woodlands as habitat. Historically, the policy of Los Angeles County has been to consider impacts to oak trees as a biological impact under CEQA and to require mitigation to offset losses to oak habitat in addition to the requirement of individual tree replacement mandated by the Oak Tree Protection Ordinance.

The Los Angeles County General Plan Land Use, Conservation and Open Space Elements include policies aimed towards preserving natural resources, such as the Hillside Management/Performance Review Procedure. Approvals of residential development proposals are contingent on the project's ability to preserve distinct visual characteristics or community assets (such as oak trees). Performance Review Criteria assesses the quality of the project's design, which should preserve to the degree possible major natural features. That includes stands of oaks and other native trees.

Old Glory Oak, Stevenson Ranch Santa Clarita
Source: Rosi Dagit

Additionally, the County has designated 61 Significant Ecological Areas (SEA) to help preserve rare plants and animals and ecological diversity. Many of the SEAs include examples of oak woodland habitat, which the County intends to preserve from urbanization pressure. SEAs were defined and delineated in conjunction with the Special Management Areas maps of the County General Plan. Proposed development proposals located within or adjacent to an SEA are reviewed by the County's SEA Technical Advisory Committee (SEATAC). These developments must be found to be highly compatible with the biological resources present within the SEA. SEATAC is comprised of seven members from the private and public sector, each with biological expertise. The purpose of the SEATAC review is to determine if the project's impacts on biological resources are adequately and accurately assessed, avoided or mitigated.

Stevenson Ranch Source: Christy Cuba

Residential projects approved within the unincorporated County that resulted in noteworthy losses of oak woodlands are Lyon Canyon Ranch west of Interstate Highway 5 and north of Calgrove Boulevard; La Vina Specific Plan in unincorporated Altadena; and the Mountainview project, north of Highway 101 and east of the City of Calabasas. These conversions have primarily occurred within areas of the County's mountain ranges outside of the Angeles or Los Padres National Forests. Conversions also occurred in the Santa Monica Mountains, Santa Susana Mountains, Puente Hills and the Liebre Mountains. The City of Santa Clarita, prior to incorporation, experienced a loss of valley oak woodland/savanna through the conversion to urban development.

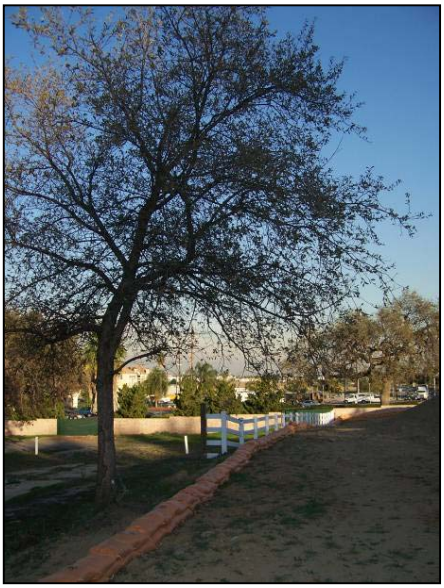
Placeholder for discussion of development projects that have preserved and set aside significant areas of oak woodands – looking for public & private input on this for recognition of successful integrated planning efforts by development community….

Local and regional housing growth demands new infrastructure, including highways and roads. Examples of projects with major road improvements necessitated by safety concerns and increased traffic volume to and from subdivisions throughout the County are: Stevenson Ranch in Pico Canyon; the Palmer golf course project at Sloan Canyon and Hasley Canyon Roads; Via Princessa widening at Fair Oaks Ranch, and; Westridge, west of Interstate Highway 5 and south of Magic Mountain Parkway. Westridge bisected the last remaining large stand of valley oak woodland in the County. Road expansion projects located in regions where oak woodlands are found will continue to threaten these resources. The Sunshine Canyon landfill west of Newhall Pass is probably the infrastructure project that impacted the largest area of oak woodland for any single project in the County.

Placeholder for description of the above referenced projects' mitigation status and discussion.

Fragmentation

Fragmentation refers to the disruption of contiguous oak woodlands into smaller pieces that are separated by varying distances. The resulting isolated islands of oak woodland habitat are subjected to increased edge effects associated with proximity to developed areas. Impacts to native wildlife from domestic cats and dogs, increased populations of meso-predators such as raccoons and coyotes, invasions of non-native plant species, and increased night lighting and irrigation all increase along the perimeter of fragmented habitats. The net effect of these disruptions results in degraded habitat and loss of biodiversity.



Valley oaks isolated in development
Source: Christy Cuba

As new development intrudes into intact oak woodlands, fragmentation can directly impact natural reproduction. Oaks are wind pollinated and it has been shown that for maximum pollination to occur, valley oak trees need to be within 100-300 meters of each other (Sork, et al 2008). As the density of individual trees goes down and distances between individuals increases, the likelihood of successful pollination decreases. The inability to produce acorns has long term implications for sustainability that need to be carefully considered.

Infrastructure

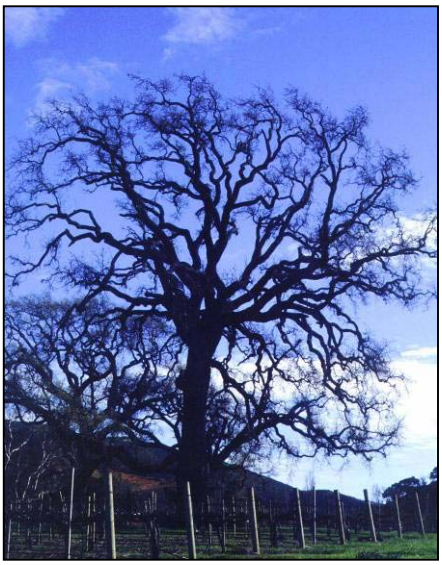
Currently the County Department of Public Works, as well as Caltrans, and utility companies are exempt from complying with oak tree protection requirements, although not exempt from complying with carbon emission requirements. Roads, power poles and water lines are found in the majority of oak woodlands within Los Angeles County.

Utility repacement Source: Christy Cuba

Maintenance activities such as those that involve trenching within oak woodlands, and pruning oak trees to provide line and roadway clearance can have significant impacts. This work should be done in accordance with the policies and requirements of the Oak Tree Protection Ordinance and incorporate Best Management Practices to reduce impacts.

Agriculture

There is an increasing trend to convert oak woodlands to vineyards, especially in the Santa Monica Mountains region of the County. The County is developing a Vineyard Ordinance (2009), providing the opportunity for preservation of oak woodlands to be recognized and incorporated into this ordinance.



Vineyard – Santa Barbara Source: Rosi Dagit

Vineyards have the potential to significantly increase erosion and sedimentation, especially on steep slopes formerly covered by deeply rooted chaparral and oak woodland. It is possible to retain substantial oak woodlands around the perimeter of vineyards, but Best Management Practices such as bioswales, limited use of fertilizers, pesticides and herbicides, limited irrigation and use of ground cover crops are essential.

One of the main problems with conversion of oak woodlands to vineyards is the impact to oak dependent plant and animal species. Conversions near riparian corridors or core habitat areas have a greater impact than conversion in previously fragmented or degraded areas. Large mammalian

predators prefer wide habitat corridors linking to core habitat and preferentially use those areas with the least amount of disturbance (Hilty and Merelender 2004).

Low Groundwater Levels

Low groundwater tables resulting from groundwater overdraft can be particularly problematic for valley oak survivorship. Valley oaks often produce deep roots that can reach the ground water. This allows the tree to access a constant supply of moisture throughout the summer and permits fast growth of the canopy. Because the tree canopy is dependent on this permanent source of water, a substantial drop in the depth of the water table puts the tree under severe water stress. Although root growth can keep pace with minor fluctuations in the groundwater table, roots cannot grow fast enough to compensate for a rapid drop of several feet or more in the water table level. Furthermore, once the tree becomes severely water stressed, root growth is adversely affected, which can cause a spiraling cycle of increasing water stress that can severely debilitate or kill mature trees.

Transplanted oak in altered site
Source: Rosi Dagit

Large, mature valley oaks are more susceptible to rapid reductions in water table depth than are younger trees that may be able to adapt more rapidly to changing conditions. In addition, effects of lowered water table depth are more severe in sandier soils that store relatively low amounts of moisture in the soil profile than loam or clay loam soils.

Fire Frequency

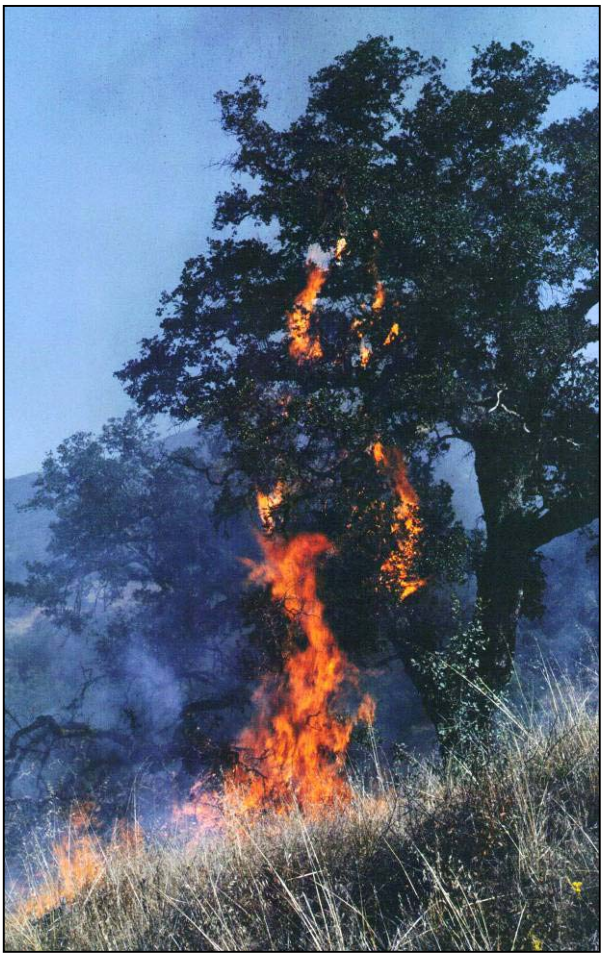
Native Americans used periodic low intensity fires as a management tool to enhance oak regeneration, reduce pests and diseases and reduce competition from dense annuals that reduces water availability (Blackburn and Anderson 1993). Oak trees have thick bark and the ability to regenerate lost canopy quickly following periodic burns, but at a cost. The use of stored energy reserves reduces the vigor of the tree for several years and can result in lower acorn production (Plumb 1980). Changes in fuel loads related to fire suppression and fuel modification policies over time have altered the dynamic of wind driving wildfires in the oak woodlands and chaparral mosaics found along the urban-wildland

interface (Franklin 1995). Unfortunately, high intensity summer/fall wildfires are now the norm, and the impacts of these large-scale burns appear to inhibit oak regeneration, as well as reduce the health and vigor of mature trees that are burned. Thus the interval time between fires, as well as the intensity of the fires, has a significant impact on the integrity of oak woodlands. **Figure 8 – Fire History in Oak Woodlands in Los Angeles County** illustrates a 50-year fire history in the County with an oak woodlands overlay. It does not include our most recent fires.

Destruction of oak woodlands by wildfire has rarely been evaluated, and yet the potential loss of both existing stands and opportunity for regeneration are significant. Large stands of oak woodlands do recover from wildfires, but it takes many years. In the meantime, regeneration is lower and the overall health of the stand is compromised.

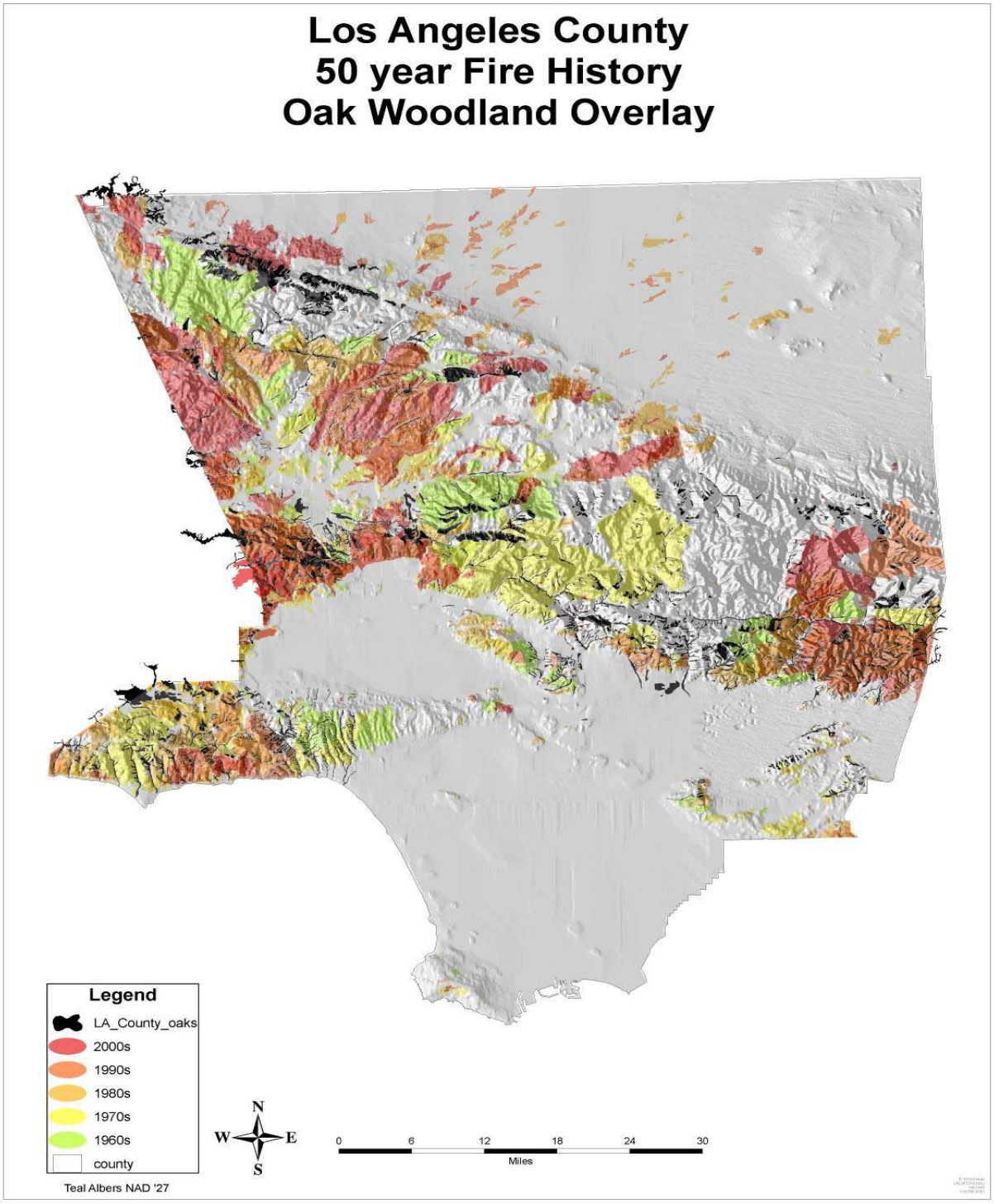
Fuel Modification Impacts

Oaks are considered to be one of the safest trees within a wildfire context, due to their slow ignition rates. However like everything else, they will eventually burn. Clearing oak woodlands for fire protection within 100-200 feet of structures is fast becoming a major impact to oak woodland resources in Los Angeles County. Removal of understory shrubs and either limbing-up or thinning oak trees results in a loss of structural and species diversity. As the number of structures within oak woodlands increases, the resulting fragmentation could have severe repercussions for long-term sustainability.



Fire ladder Source: Tom Scott

Figure 8 - Fire History and Oak Woodlands in Los Angeles County

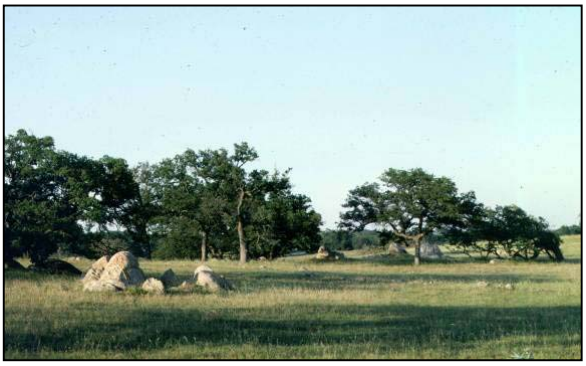


Source: Los Angeles County Fire Department, Forestry Division

CEQA Evaluation of Oak Woodland Conversion

The California Environmental Quality Act (CEQA) requires a jurisdiction, such as a city or county, to analyze impacts to existing biological resources that may occur when a particular project proposal requesting a discretionary approval from that jurisdiction is being considered. Potential impacts to oak woodlands resulting from the implementation of a proposed development project are analyzed as a component of the biological resources of a project site. According to Appendix G of the *State CEQA Guidelines*, a project may result in significant impact to biological resources if it would:

1. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations or by the CDFG or USFWS;
2. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, or regulations or by the CDFG or USFWS;
3. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
4. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
5. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
6. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Conservation Community Plan, or other approved local, regional, or state habitat conservation plan.



Source: Tom Scott Engelmann oaks

Using the significance thresholds listed above, potential impacts to oak woodlands could fall under the following categories:

Category 1: if an oak species were considered to be a sensitive species (only *Quercus dumosa* may be considered of special-status because of its California Native Plant Society listing of 1B.1 - considered to be very rare and very endangered);

Category 2: where an oak species is a component of riparian vegetation or is a vegetation community considered by the California Department of Fish and Game (CDFG) as sensitive, (Valley oak, Engelmann oak and Island oak woodlands are sensitive plant communities), or;

Category 5: when developments do not comply with replacement or other mitigation provisions of local ordinances the impacts could be significant.

Impacts to oak woodlands could also constitute breach of a significance threshold for any of the following categories of significant thresholds of the State CEQA Guidelines:

Category 3: Riparian vegetation is essential to cleansing runoff and percolated water and to ameliorating temperature and climate for the wetland. Riparian vegetation provides erosion control and habitat for riparian and other species. If riparian vegetation includes oak woodlands, the woodland removal or serious impact to the woodland can impair the wetland's water quality and climate in a significant way.

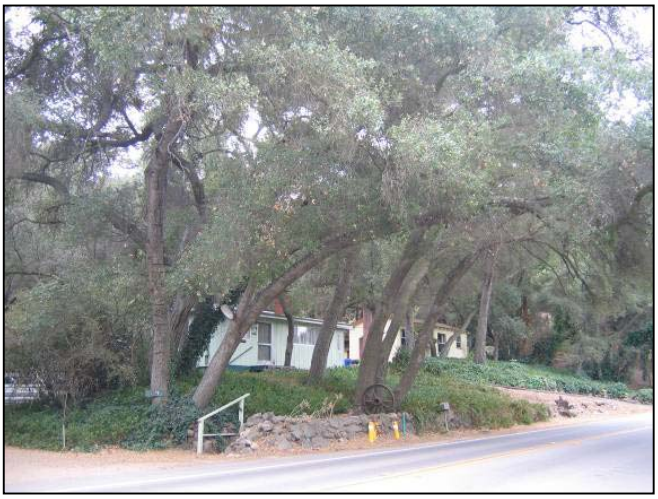
Category 4: Oak woodlands often provide cover needed by many kinds of wildlife as they move along wildlife corridors. Removal of or impact on the woodland can seriously impact ability of much wildlife to use the corridor. Substantial removal could convert the corridor from useable to dysfunctional.

Category 6: Oak woodlands may be an important part of Significant Ecological Areas (SEAs) in Los Angeles County. There are some Sensitive Ecological Resource Areas (SERAs) that are designated especially for their oak woodlands. The criterion for approval of a Conditional

Use Permit for development within an SEA and SERA is that the development design be highly compatible with the biotic resources present including preservation of appropriate and sufficient undisturbed areas. A proposal to remove or seriously impact oak woodland within these specially designated areas could result in a significant impact.

Los Angeles County is rich in oak woodland resources in both hillside and riparian habitats. The County has excellent representatives of black oak (*Quercus kelloggii*), canyon live oak (*Q. chrysolepis*), coast live oak (*Q. agrifolia*), and interior live oak woodlands. Blue oak (*Q. douglasii*) woodlands reach the southern limit of its distribution in the far northwest part of Los Angeles County. None of these oak woodland associations are considered to be sensitive plant communities by the CDFG. In addition, the County has representatives of valley oak (*Q. lobata*), Engelmann oak (*Q. engelmannii*), and island oak (Q. *tomentella*) woodlands, all of which being recognized as sensitive plant communities by CDFG along with southern coast live oak riparian forest associated with the bottoms of the wetter drainages.

There is currently no oak species occurring within Los Angeles County that is considered a special-status species by CDFG. The valley oak and the Engelmann oak are considered by the County to be locally sensitive species. Protection for individual trees is provided through the provisions of the County's oak tree ordinance (Part 16 of the County zoning code, sections 22.56.2050 through 22.56.2260), originally established in 1982 under Ordinance 82-0168. The processing of an oak tree permit is intended to provide protection to individual trees but consideration of the oak woodland as a habitat and its association ecology did not receive protection under this ordinance.



Non-native understory, Topanga Source: Rosi Dagit

As the majority of oak woodland resources in the state are not considered to be sensitive vegetation associations, their protection is implemented through the application for the CEQA, and now CEQA implementation of Public Resources Code

Section 21083.4, Conversion of oak woodlands. California Senate Bill 1334 was authored by Sheila Kuehl and enacted in 2004.

CEQA provisions became effective in January 2005. This new CEQA section requires a county (these provisions do not apply to incorporated municipalities) to be responsible for analysis of impacts to oak woodlands and when found to be significant, the County, as lead agency, must require mitigation for the impacts to the oak resource.

CEQA carbon provisions apply to all local jurisdictions. The following are the provisions within CEQA for the protection of oak woodlands:

CEQA Section 21083.4 Conversion of Oak Woodlands

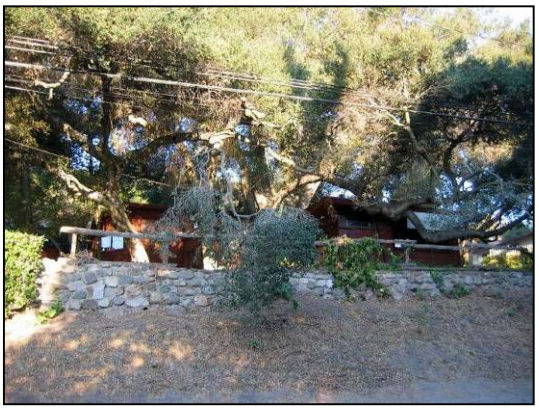
a) For purposes of this section, "oak" means any native tree species in the genus Quercus not designated as commercial species pursuant to regulations adopted by the State Board of Forestry and Fire Protection pursuant to Section 4526 and that is 5 inches or more in diameter at breast height;

b) As part of the environmental determination pursuant to Section 21080.1, a county shall determine whether a project within its jurisdiction may result in a conversion of oak woodlands that will have a significant effect on the environment. If a county determines that here may be a significant effect to oak woodlands, the county shall require one or more of the following oak woodlands mitigation alternatives to mitigate the significant effect of the conversion of oak woodlands:

1) *Conserve oak woodlands, through the use of conservation easements;*
2) *A) Plant an appropriate number of trees, including maintaining plantings and replacing dead or diseased trees.*
   B) The requirement to maintain trees pursuant to this paragraph terminates seven years after the trees are plants;
   C) Mitigation pursuant to this paragraph shall not fulfill more than one-half of the mitigation requirement for the project;
   D) The requirements imposed pursuant to this paragraph also may be used to restore former oak woodlands.

3) *Contribute funds to the Oak Woodland Conservation Fund, as established under subdivisions (a) of Section 1363 of the Fish and Game Code, for the purpose of purchasing oak woodlands conservation easements, as specified under paragraph (1) of the subdivision (d) of that section and the guidelines and criteria of the Wildlife Conservation Board. A project applicant that contributes finds under this paragraph shall not receive a grant from the Oak Woodlands Conservation Fund as part of the mitigation for the project.*
4) *Other mitigation measures developed by the county.*

c) Notwithstanding subdivision (d) of Section 1363 of the Fish and Game Code, a county may use a grant awarded pursuant to the Oak Woodlands Conservation Act (Article 3.5 (commencing with Section 1360) of Chapter 4 of Division 2 of the Fish and Game Code) to prepare an oak conservation element for a general plan, an oak protection ordinance, or an oak woodlands management plan, or amendments thereto, that meets the requirements of this section.



Coast Live Oak growing inside house, Topanga
Source: Rosi Dagit

These CEQA provisions Exemption: Projects under an approved Natural Community Conservation Plan that includes oaks and affordable housing projects for lower income households are exempt from these CEQA provisions.

Threshold of Significance

The problem that the County faces is the determination of the threshold of significance for impacts to oak woodlands. This is especially true for those areas of the County such as the residential areas within the Santa Monica Mountains, like the Topanga community, or along the foothills of the San Gabriel Mountains in communities like Altadena or Santa Clarita. In these areas, as in others, the oak woodland has already been disturbed through the construction of single-family residences and community commercial centers over many decades.

Valley Oak in Calabasas parking lot
Source: Rosi Dagit

The UC Integrated Hardwood Range Management Program has prepared in 2008 the "*Oak Woodland Impact Decision Matrix: A Guide for Planners to Determine Significant Impacts to Oaks as Required by SB 1334"* to assist counties and other lead agencies to make an informed decision of the significance of impacts to oak woodlands. In this guide, it is suggested that the potential impacts be evaluated on three levels; landscape, site and individual trees. The guide further indicates that impacts may be specific to one level and not the others, or to more than one level, including all three. This evaluation process embraces the species composition of the habitat, the overall cover provided by the tree canopy, as well as the individual trees that may be impacted. Additionally, the evaluation considers the landscape function of the woodland where impacts to the habitat may interrupt wildlife movement through the implementation of a project.

A well-evaluated project impact will not necessarily be easy and should consider as much of the ecological function of the woodland habitat in the analysis of impacts. For reference, **Table 9 - The Impact Prediction Checklist**, created for this plan is located on page 107.

Cumulative impacts to oak woodlands involve consideration of the changes to oak woodland communities resulting from the specific project under review and the development of all other recent, approved and pending projects of which the lead agency is aware. For Los Angeles County, such projects would concern impacts to valley oak and Engelmann oak woodlands that may not have significant impacts from the project itself, but when combined with other projects impacting the resources, could trigger a significant impact for which mitigation is not feasible, chiefly because the areas available for these habitats to exist have been greatly reduced.

Carbon Sequestration Estimation

AB32 legislation requires the state of California to reduce its emissions by 20% by 2020, and also includes long-term goals for further reductions. As part of AB32 implementation, the state is requesting that all counties develop a local Climate Action Plan to help achieve the goal of reducing emissions to 1990 levels by 2020. In July 2009, the Natural Resources Agency issued regulatory amendments for CEQA analysis and mitigation for the potential effects of greenhouse gas (GHG) emissions. It is now essential that carbon sequestration impacts associated with oak woodland conversion be clearly documented. Each county is allowed to identify a reasonable threshold of significance. However, due to the complexity of replacing the benefits of oak woodlands, it is difficult to consider their loss as anything but significant.

Conversion of oak woodlands has both direct and indirect cumulative impacts on the levels of biological GHG emissions. Direct emissions are associated with disposal of impacted trees and understory debris (down wood, mulch, roots, etc.). The indirect cumulative impact is a result of the loss of carbon sequestration potential over time. Each single mature coast live oak has the potential to sequester over nine (9) tons of carbon in a 50 year lifespan (Sacramento Municipal Utility District Tree Benefits Estimator). An acre of trees produces enough oxygen for 18 people and removes 2.6 tons of carbon dioxide each year (CaUFC Tree Facts). Overall, it is estimated that oak woodlands and forests in California currently sequester approximately 325 million tons of above- and below-ground carbon (Gaman 2008).

Retained oaks on development Source: Christy Cuba

In order to analyze both the direct and indirect cumulative impacts, each oak woodland conversion project must include in the CEQA document the answers to the following questions:

1. *How much sequestered carbon dioxide will be released if the live trees over three inches or greater in DBH (including roots), standing dead trees or downed-woody debris are burned or otherwise disposed?*

Since 2006, the California Air Resources Board (CARB) and the California Climate Action Registry have been developing Forest Protocols (recently adopting the new version 3.0) which provide the measurement methodology to analyze forest carbon. Using these methods in conjunction with a forest inventory, foresters and arborists can measure carbon biological emissions associated with the conversion of forests to non-forest uses. There are several other tools available to estimate these values including the US Forest Service Carbon Online Estimator Tool (USFS 2008) and iTree, both of which are available online. Only the CARB forest protocols are sanctioned by the State of California and specifically recognized by CEQA. Moreover, under the protocols, all CEQA reports that reference carbon biological emissions must be submitted with the oversight of a state registered professional forester certified by the Climate Action Reserve.

2. *How much potential carbon dioxide sequestration over the next 100 years will be lost as a result of the proposed project?*

Oak trees live on average for approximately 100 years, and the cumulative sequestration provided by existing oak woodlands is significant. Projecting out the amount of carbon sequestered over an additional 100 years for woodlands that will remain intact, versus those that will be developed provides a basis for understanding how much contribution these trees make. This can be estimated using a number of modeling tools available on-line including FVS, the US Forest Service Forest Vegetation Simulator, and the tools noted above.

Mitigation oak planting
Source: Rosi Dagit

3. *How will the loss of oak woodlands and the carbon sequestration they provide be mitigated?*

The more traditional mitigation measures such as on-site tree preservation and planting seedlings will not do much to help offset the losses associated with removal of oak woodlands. Effective mitigation will need to not only replace the lost acreage

by protecting an equivalent stand of comparable size, but also recognize that plantings will take 30-100 years to be effective at sequestering carbon. The costs of mitigation will be significant.

Because of the long time lag between planting new trees and effective carbon sequestration, it appears that preservation is the only way to mitigate forest carbon biological emissions to less than significant. Avoiding carbon biological emissions now is probably more effective than relying on future emissions avoidance from still to be implemented mitigation measures. Also, the complexity of developing suitable mitigation measures can render them mostly ineffective when they are implemented.

Sapling Valley oak

Mature Valley oak
Source: Christy Cuba

III. ELEMENTS OF THE LOS ANGELES COUNTY OAK WOODLAND CONSERVATION MANAGEMENT PLAN

The goal of the Los Angeles County OWCMP is to develop a consistent policy for the management of oak woodlands. Developing a comprehensive and cohesive strategy for dealing with loss and creating opportunities for recovering oak woodlands at a commensurate rate should be the focus of planning and community efforts.

In order to be eligible for project funding under California Assembly Bill 1334 242 (Oak Conservation), counties must create an Oak Management Plan. Most county plans focus on the characteristics of their oak woodlands, and use characteristics like distribution of species to frame plan activities. Los Angeles County however, is far more urbanized other counties with oak management plans. Woodland characteristics are important in oak management, but the limited remaining woodland area (> 45%) forces the County to focus on the woodland-to-suburb conversion rather than the characteristics of the woodlands.

The implementation strategy has three components, which encompass the range of outcomes for oak woodland management:

(1) Preservation, where oak woodlands remain intact and functional;
(2) Conservation, where woodlands are integrated into land development; and,
(3) Sacrifice, where loss of oak woodlands is mitigated off-site.

The Preservation and Sacrifice categories are self-evident; woodlands are either preserved or lost. The third category, Conservation, covers oaks woodlands from backyards to community open space. It reflects the gradient of woodland resource quality already present in Los Angeles suburbs and the urban-wildland interface. The goal is to maximize the values of oak woodlands in a human-dominated landscape, with the recognition that these values must be matched

Riparian oak corridor on urban edge
Source: Christy Cuba

against existing conditions and the other demands for land-use in Los Angeles County.

The outcomes for preservation, conservation, and sacrifice can also be viewed as options for property owners. For example, large land holders, such as Tejon Ranch, have a preservation strategy, agreeing to Habitat Conservation Plans in exchange for an unencumbered ability to develop other areas of their property. Small landowners with limited options for conservation or preservation may opt for the sacrifice strategy, where they mitigate the loss oaks during construction by contributing to a conservation fund. Other landowners may conserve oaks woodlands by incorporating them into development plans, maximizing the amenity value of these woodlands in home sale prices.


Source: Rosi Dagit

The key issue is developing a strategy that encourages self-selection by landowners into the appropriate strategy for the location, type, and quality of their oak woodlands. The measurable goal of the OWCMP would be the acreage of woodlands preserved, conserved, or sacrificed, relative to idealized (negotiated) goals for the proportions of Los Angeles County woodlands in each category. The plan would advocate the development of a GIS system to track the woodland categories to insure that adopted proportions were achieved as the County builds out (in theory to 2040).

PRESERVATION

Preservation is the preferable way to ensure the long-term persistence of oak woodlands in Los Angeles County. Preservation provides the potential to protect and maintain the biological integrity of existing oak woodlands, incorporating all the comprehensive interdependent elements (soil, hydrology, species associations, connectivity, etc.). Essential to this effort is the opportunity to document the current status of oak woodland function on multiple scales, from the individual parcel to watershed level to regional context. This baseline will allow the County to accurately evaluate cumulative impacts associated with proposed land development and track these impacts over time.

Oak Woodland Environmental and Initial Study Questionnaires

At the beginning of a project, be it an addition to an existing residential structure, a redevelopment project, or a new subdivision, the applicant must submit the appropriate package of plans, applications, studies and technical reports for the project. As part of the package, applicants must complete an environmental questionnaire and submit existing site photographs. County planning staff then review all the documentation and complete an Initial Study Questionnaire (ISQ) for the project, as required under the California Environmental Quality Act (CEQA). The ISQ is used to assist the planner in making a CEQA determination for the project. The ISQ lists a variety of environmental factors that may be affected, either individually or cumulatively, by the development of the project. Once the ISQ is completed, the planner decides if the project qualifies for a Negative Declaration or will require an Environmental Impact Report. The CEQA process evolves from there based on the determination.

As a tool of this plan, if a project is located in designated oak woodland area (as shown on **Figure 4**), the applicant will be responsible for completing an expanded Environmental Questionnaire (EQ). The expanded EQ will provide information for the planner to use in support of the expanded ISQ that we are proposing in this plan. A copy of the proposed expanded EQ and ISQ documents are provided in the **Appendix 1** of this Plan. Use of the expanded forms in the early planning stages of a project will assist planners and applicants to address the potential impacts of a project on oak woodland habitat, not just individual oak trees. Early identification of the resources present on a property and education of the property owner as to their alternatives will allow for informed project planning.

Creating Oak Woodland Conservation Management Plans

The goal of conservation management plans is to manage and sustain a functional ecosystem for the future. A critical element of adaptive management is responding to changes in the condition of a preserved oak woodland following natural disasters like fire and flood, intrusions from development along the boundaries, invasions of exotic flora and fauna. Successful Oak Woodland Conservation Management Plans will explain why the project woodland is significant and detail how that essence will be sustained in the face of any new use, alteration, restoration or surrounding conditions.

The US Fish and Wildlife Service has specific requirements for the development of Habitat Conservation Plans. Oak Woodland Conservation Management plans need to include but not be limited to the following elements:

- Clearly describe the baseline conditions of the site
- Identify immediate management needs
- Define clear objectives and goals for long-term sustainability
- Outline an action plan for adaptive management
- Establish a monitoring plan
- Identify responsible parties (who does fuel modification? Monitoring? Enforcement, etc.)
- Provide adequate funding

There are several established Plans in southern California that can be used as the template for developing suitable plans for all oak woodlands that are to be preserved in perpetuity.

Incentive Strategies for Oak Woodland Conservation

A main priority of the Los Angeles County OWCMP is to prevent impacts to existing oak woodlands and reward private landowners who take voluntary actions to preserve and restore these resources. To that end, the following incentive ideas are proposed for consideration. It is hoped that additional incentives will be developed and added to further encourage conservation of oak woodlands.

While the priority is to enhance preservation and restoration of oak woodlands within the Potential Oak Woodland Conservation Areas, any property located within a mapped oak woodland, or that can demonstrate suitability for the existence of an oak woodland on the parcel could qualify.

Dedications or Donations of Land

Dedication of conservation easements or donation of oak woodlands to a public trust is one way to achieve the goals of the Los Angeles County OWCMP. While this option applies more to larger developments, it also has implications for single family residences as well.

Avoided Permitting, Mitigation and Monitoring Costs - Streamlined CEQA Process

It is possible in many cases for sensitive development design to work with and around existing oak woodlands, rather than remove or degrade them. Los Angeles County requires permit fees for impacts to both individual oak trees (LA CO Oak Tree Protection Ordinance) and potentially to oak woodlands. If a development project that is subject to discretionary review by the County is determined through the Initial Study process to pose potentially significant impacts to biotic resources such as oak woodlands, then additional environmental evaluation in the form of a Mitigated Negative Declaration, or Environmental Impact Report are required.

Often, the impacts associated with developing with these sensitive biological areas also requires permits from other regulatory agencies such as the U.S. Army Corps of Engineers, California Department of Fish and Wildlife, California Coastal Commission and the Regional Water Quality Control Board. Depending on the complexity of the issues, these permits and the CEQA process can take years to complete. The mitigation measures identified as being necessary to mitigate significant impacts may also add to the cost of the project. Identifying and quantifying the carbon sequestration impacts add another layer of complexity to the process.

When a development is designed to avoid impacts to the oak woodlands, the time, permit application development, mitigation and monitoring implementation costs may be avoided. In addition, designs that do not require these additional permits can move more quickly through the Regional Planning evaluation process, expediting the project timeline.

Canyon live oak acorn Source: Christy Cuba

Mitigation requirements can vary from replacement planting to providing funds to either secure twice the amount of oak woodland habitat that will be lost or match the Council of Tree and Landscape Appraisers (CTLA) value for the trees, whichever is more. Mitigation will also be required to offset the loss of carbon sequestration provided by the existing stand. The costs of these mitigations can be quite high. A typical mature, healthy coast live oak located in oak woodland can be valued as much as $100,000.

Carbon Sequestration Benefits

Carbon cap and trade systems are not yet in place, but the fees associated with offsetting the loss of oak woodlands could be substantial. One acre of oak trees removes 2.6 tons of carbon dioxide from the air (CaUFC 2009). Quantifiable benefits to carbon sequestration stemming from the preservation, enhancement or expansion of healthy oak woodlands should be used to provide additional financial incentives to property owners who permanently maintain oak woodlands. These protocols may be based on the Forest Project Protocols now being created by the California Climate Action Registry (a project of the Climate Action Reserve) or other recognized sources. Carbon credits or emissions available through either state or federal programs or available on the private market may also be incorporated into this program.

Existing Oak Woodland Expansion Credits

If a property owner has preserved, protected or expanded the extent of oak woodland canopy cover on their property over a minimum of five years, then limited additions or expansions of the development footprint could be mitigated by the on-going stewardship efforts.

Canyon live oak seedling, San Gabriel Mtns.
Source: Christy Cuba

Los Angeles County currently uses aerial photographs taken regularly to evaluate changes in vegetation cover. If a property owner can prove that the oak woodland canopy cover on their parcel has expanded by more than 10% over time, then that expansion will be evaluated and used to fulfill mitigation requirements.

For example, suppose a landowner wishes to put an addition on an existing house located within oak woodland. If he has owned the property for more than five years, he can obtain copies of the aerial photographs covering that parcel and as part of an oak tree report or oak woodland report, document recruitment of new saplings, extent and integrity of the understory vegetation, and document the

potential impacts. If the impacts are less than or equal to the mitigation that would be required, then the loss of a percentage of oak woodland would be allowed.

Fuel Modification Benefits

Each year County residents in High Fire Danger areas incur significant costs in order to meet fuel modification requirements. Clearing up to 200 feet from all structures can be very costly. The presence of oak woodlands significantly reduces clearance costs because:

- The native understory of oak woodlands typically contains less flammable vegetation.
- Oak trees are harder to ignite and not as prone to explosion, which means they require less pruning and thinning.
- [MSOffice1][MSOffice2]Oak stands that are well maintained (deadwood removed, retaining native leaf litter and perennial native shrubs and forbs) prevent slope failure, reduce erosion and can slow a wildfire down.

Oak woodlands remaining after Station Fire, Arroyo Seco
Source: Christy Cuba

Low intensity fires (such as prescribed burns) have traditionally been used by Native Americans and fire managers to reduce the fuel loads within oak woodlands, reduce pests and diseases and recycle nutrients. Using hand clearing methods, all of these management goals can be met even without prescribed burns. The cost of maintaining required fuel modification within or adjacent to an oak woodland is significantly less than similar fuel modification required for chaparral, or watering and care of non-native tree and landscape plants. Further, existing woodland maintenance require far less water, a scarce and usually imported commodity that is becoming more costly.

Land Acquisition

Outright purchase (fee simple) acquisition of valuable oak woodland resources is the most direct way to ensure long term protection, however funds for such purchases are limited. One of the benefits of

the OWCMP is that the Priority Oak Woodland Conservation Area map highlights the areas where oak woodland conservation funds should be directed first. Funding from the LA County Oak Woodland Fund, as well as possible funding from the state Oak Woodland Fund (managed by the Wildlife Conservation Board) or other grant sources will first be directed towards obtaining parcels identified as important either due to current intact conditions or location with respect to other woodlands that would enhance connectivity.

Conservation Easements

Both the County and local Land Trusts are able to accept dedication of conservation easements. These easements allow the landowner to retain title for the land, but the County or Land Trust would obtain any development rights. By not exercising those rights, development of that land is prevented. Dedication of a conservation easement "runs with the land", meaning that the development restrictions will continue in perpetuity, even if the land is sold.

The easement must be donated for one of the following conservation purposes[4]:

- Preserving land areas for outdoor recreation by, or the education of, the general public. This includes preserving a water area for boating of fishing, or preserving a nature or hiking trail. The public recreation or education use must be substantial and regular.
- Protecting a significant natural habitat of fish, wildlife, plants or a similar ecosystem. Public access may be restricted, e.g., to protect the habitat.
- Preserving open space (including farmland and forest land) for the general public's scenic enjoyment or under a governmental policy. The public must receive a significant benefit.
- Preserving an historically important land area or a certified historic structure. In this case, an easement on a private residence may qualify

Oak woodlands are likely to fall under any of the first three categories, though choosing the second option may result in significantly more continued privacy than the others.

[4] Source: Tax Research Service

Why would a landowner give up property rights? In fact, the landowner is not losing property rights; he is controlling the future of his land by extinguishing them. Many landowners are motivated by personal, ethical or aesthetic reasons and want to ensure the long term sustainability of their property. Conservation easements provide a landowner an opportunity to protect a family oak woodland permanently, while still using existing structures or other uses.

There are several mechanisms for a landowner to benefit from dedicating an Oak Woodland Conservation Easement, including both income and estate tax benefits.

1. Income and Property Tax Credit

   Landowners who donate oak woodland conservation easements can receive a tax receipt for the full value of their ecological gift. This could be applied both to the local County property tax amount, as well as meet the US Federal Income Tax deduction criteria. Congress passed a bill in 1976 (Section 170(h)(1)) to encourage donation of environmentally sensitive lands that will provide significant public benefit and preserve open space. (Open Space Protection Collaborative 2007)

   Real estate developers do not qualify under this provision unless the donation is above and beyond that required by zoning or other planning regulations.

   If the property has been owned for more than one year, the owner can deduct the market value of the donation up to 30% of their contribution base and can carry forward the unused balance for up to five years.

   If the property has been owned for less than one year, then the individual can deduct the cost basis of the gift up to 50% of their contribution base for the year, with the unused balance carried forward for up to five years.

Value of the donation is based on the market value of the property before the easement minus the market value of the property with the easement. This value must be established by a qualified appraiser in accordance with federal standards.

The donation of the easement reduces the cost basis for the portion of the land retained by comparing the ratio of value before and after the easement is recorded. For example, if an oak woodland parcel is worth $2,000,000 and the conservation easement is worth $1,000,000. If the cost basis before the easement was $100,000, then following the easement the cost basis becomes $50,000.

If the property is located within a Priority Oak Woodland Conservation Area, donation of the easement may result in reduced property tax assessment due to the decreased market value of the property.

2. Estate Planning

Landowners who donate oak woodland conservation easements may receive estate tax benefits, provided that they exceed the federal estate tax exclusion, which is currently $3.5 million per person. The maximum for the exclusion is $500,000 or be up to 40% of the assessed land value, whichever is less value.

Public trail in woodlands Source: Christy Cuba

3. Transfer of Development Rights

Los Angeles County has a program in small lot subdivisions of the Coastal Zone where lots that are limited in allowable square footage can be retired in perpetuity, and the square footage transferred to another parcel. In the case of oak woodlands, transfer of development rights for parcels within Priority Oak Woodland Conservation Areas would be obtained in exchange for higher density development in already disturbed locations.

CONSERVATION

Conservation implies a directed effort to protect existing oak woodland resources. Oak woodlands are dynamic systems that are constantly responding to their environment. Although oaks are long lived, they are susceptible to impacts from both natural sources (diseases, pests, fire) and human sources (soil compaction, altered hydrology, topographic alteration). To integrate oak woodlands and development in a meaningful and sustainable way requires effort and consideration from the time a project is conceived until long after it is constructed. When oak woodland preservation is incorporated into the design and execution of a development, the opportunity exists for creating a compatible project that maximizes the contributions for the property owner and the community.

Integrating Oak Woodlands into Development Design

As the pendulum swings more towards "green" development, the opportunity for incorporating oak woodland protection into project designs in a meaningful way is seen as a viable opportunity by developers. The guiding principle for meaningful conservation is eloquently stated in the County's Santa Monica Mountains North Area Plan.

Streamside road with public building beyond
Source: Christy Cuba

"Let the land dictate the use."

Essential to this effort is the integration of oak woodlands as an integral part of the project from the start. Oaks are persistent and forgiving. If we consider them as a living, growing part of the site infrastructure, like roads and utilities, we can begin to integrate them into the overall design in a functional way.

Oak woodlands need to be considered on a variety of scales in order to meaningfully incorporate them into a development design. Natural systems share several basic elements. They are connected and continuous on many scales. They are dynamic, living systems that respond to the environment continuously.

This evaluation process starts with the individual trees along the perimeter of the woodland. Move outward to identify the interrelationships between this particular stand of trees and those in the near vicinity. Evaluate the location and extent of the oak woodlands within the watershed boundaries. Finally, examine the landscape level relationships on a regional scale. Once the context of the oak woodland is identified, it is possible to explore ways to maintain connectivity and integrity of the habitat over time.

Matheny and Clark (1998) summarize the guiding principles of successful tree (and woodland) protection as follows:

- Everyone involved in designing, constructing and managing a development is committed to preservation.
- Decisions about trees are based on accurate information gained from scientific literature and accumulated experience.
- Preservation begins when the project is conceived and continues through the planning, design, construction and maintenance phases.
- Preservation is based upon the long-term survival, health and structural stability of trees and focuses the efforts on those trees offering the best potential to be assets to the site for years to come.
- Construction impacts to trees are minimized or avoided altogether.
- All members of the project team work together to minimize impacts to trees, either through design decisions or construction practices.
- Trees (and woodlands) are accurately represented on all relevant plans.
- The composition, health and structure of the woodland or forest is considered and provisions for long term management are included.
- Trees (and woodlands) selected for retention are given adequate growing space.
- Post-development impacts from surrounding land uses are managed in a way that protects the integrity of the oak woodland over time.

Defining a suitable protected zone where construction activities are prohibited is an essential step in conserving oak woodlands during this phase of development. There are no hard and fast rules, but guidelines to consider include at minimum:

- health and size of the trees on the perimeter of the oak woodlands;
- any drainage or grade changes that could impact the oak woodlands.

Woodlands present variations on the challenges typically addressed by protecting individual trees. In addition to the efforts needed to protect the trees that make up the woodland, considerations must be given to such things as:

- species composition
- sensitivity to impacts
- size of the oak woodland
- relationship to other oak woodlands (contiguity)
- stand composition
- root and canopy conformations related to site features
- structural stability when a new edge is formed
- habitat connectivity or fragmentation
- potential impacts from changes in surrounding topography and hydrology

Coast live oak in residential yard Source: Ty Garrison

Connectivity and shape of the oak woodlands makes a big difference in the potential long term sustainability of any conservation effort. Oak woodlands function as high level biological reserves, supporting a wide variety of plants and animals, all of whom have specific needs. The placement of roads and extent of edge effects are significant factors to consider. Long narrow bands of woodlands are not as sustainable as larger circular, rectangular or oblong shaped woodlands. Topographic features such as ridgelines and riparian corridors are important wildlife habitat linkages that should be considered.

The combination of these factors makes it difficult to develop a one-size-fits-all set of recommendations. Instead, the project team is challenged to make the most of the benefits provided by the oak woodlands and use them to enhance the design. Numerous professional resources exist that can aide in defining appropriate site-specific requirements. Examples of successful development in or near oak woodlands are not well documented. We hope that as this Plan evolves, suitable examples will become better known.

Best Management Practices

The Los Angeles County Oak Tree Protection Ordinance identifies numerous standard Best Management Practices (BMP's) that can be implemented to protect individual oaks before, during, and following the development process. Many of the BMP's are relevant to oak woodland protection as well. These include, but are not limited to:

Before Construction -

- Baseline documentation of the oak woodland characteristics completed.
- Identify any potential impacts and recommend mitigation measures.
- Fencing should be installed around the designated protected zone.
- Required bonds should be posted.
- All project personnel should understand the goals, guidelines and restrictions associated with the project.
- Identify enforcement options and consequences

Construction monitoring Source; Christy Cuba

During Construction -

- On-site monitoring should be required during all activities that might impact the oak woodlands.
- Maintain records of activities and decisions regarding oak woodlands.
- Work with construction personnel to protect the resources.
- Evaluate tree response to site activity and recommend appropriate action.

- Provide guidance on temporary irrigation if needed.
- Treat any tree injuries appropriately.

Following Construction -

- Develop and implement a Monitoring Plan
- Provide recommendations for managing remnant oak woodlands
- Oversee implementation of a management program to preserve woodland function.
- Oversee fuel modification procedures and hazard tree management.

Development That Sacrifices Oak Woodlands

Despite best efforts at preservation, there will inevitably be times when it is deemed necessary to lose oak woodlands. The decision to allow oak woodland destruction should be made in the context of understanding the consequences of that loss on both a local and regional scale. Cumulative impact analysis should be carefully done so that the decision makers can quantify the ecosystem service functions lost and their values to the community, the costs of replacing those ecosystem functions with suitable infrastructure, as well as the biological impacts directly related to the increased decline of oak woodland resources in Los Angeles County. With this information, the County can determine suitable mitigation values and strategies.

Oak Woodland Economic Resource Values

Oak Woodlands in Los Angeles County are considered "valuable" for a variety of different reasons. In order to make informed planning decisions, both the costs and benefits of a proposed land use action need to be examined. These valuations should be analyzed in the context of both short and long-term (50 years) impacts, as well as within the context of location. In addition, recent state legislation requires that ecosystem functions such as carbon sequestration and greenhouse gas emission reduction also be analyzed and explained. **Appendix 2** provides the background and context of ecosystem service valuation strategies that were used to develop the process recommended for Los Angeles County.

In order to evaluate these issues and make a determination that balances the preservation of the environment with development, land use changes within designated Oak Woodlands of Los Angeles County will be required to:

- Characterize the baseline contribution provided by the existing oak woodlands;
- Analyze how a proposed land use action would change this, either by enhancing the oak woodland ecosystem function or impairing it;
- Examine the proposed land use change within the context of the existing and identified restoration potential of local and regional oak woodlands (maps zones); and,
- Calculate the relative costs/benefits to the County.

The Los Angeles County Oak Tree Protection Ordinance identifies several of these values:
"As one of the most picturesque trees in Los Angeles County, oak trees supply beauty and charm to the natural and man-made landscape. Oak trees add distinct and unique aesthetic character to the areas of Los Angeles County in which they are indigenous. The oak tree permit is established to recognize oak trees as significant and valuable historical, aesthetic and ecological resources."


Valley oak Source: Christy Cuba

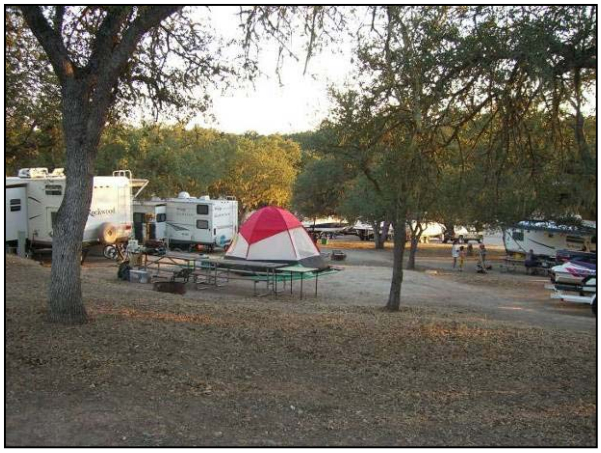
These "valuable historical, aesthetic and ecological resources" can be further defined in the context of economic costs and benefits associated with the long term survival and landscape functions provided by oak woodlands. It is only when policy requires assessment of both the costs associated with protecting/preserving/regenerating oak woodlands versus the costs associated with the loss of individual trees, habitat and ecosystem functions, that the choices between alternatives can be fairly evaluated.

Environmental economists examine these values from several different perspectives. Some believe that environmental amenities can and should be valued in exactly the same way as any other good (Baerenklau 2009). Salzman (2005) suggests that it is the role of government to pay for achieving ecosystem service protection, because these services cannot be bought or sold and thus function outside of the traditional market system.

Others feel that markets reflect individual, rather than community property values in the context of human use only, are volatile and reflect current ideas of value, but don't reflect enduring or intrinsic values. Another perspective is that only by examining the costs of restoring impaired or damaged oak woodland, can we determine how much functional oak woodland is worth (Pincetl 2009).

Non-Market Values

Typically, the benefits provided by functional oak woodlands have not been incorporated into the cost-benefit equation because they are difficult to assess. These benefits are described as *Non-Market Values*, and include those elements of oak woodlands that have no commodity, consumptive or dollar equivalency. Examples would be passive uses such as recreation, open space, and watershed protection.



Campground shaded by oaks Source: Christy Cuba

Ecosystem service values have also been hard to quantify. Oak woodlands are critical components of healthy terrestrial and aquatic ecosystems, providing habitat, preventing erosion, moderating water quantity and supporting water infiltration, sequestering carbon, filtering out air and water pollutants, moderating temperatures, and supporting watershed function.

The California Air Resources Board and CEQA have recognized that the conversion of oak woodlands to non-forest use represents potentially significant carbon biological emission effects. The air quality criteria established requires the measurement of oak woodland biological emission by documenting the live tree biomass (including roots), standing dead tree biomass, and wood lying on the ground. With this information in hand, the protocol requires that the potential carbon sequestration over the next 100 years be calculated for all trees over three inches or greater diameter at breast height (dbh), as well as determining how much sequestered carbon would be released if the live trees, standing dead trees and woody debris were burned. Comparison of the existing condition to the proposed condition following the land use change would then be used to identify the level of significance for this impact.

Additionally, there are several methodologies that are used to document the amount of water run-off reduction, air pollution filtration, temperature moderation (energy use) and erosion control benefits are provided by a tree or group of trees. Most are designed for use primarily within the urban forest context, rather than natural landscapes, however, given the proximity of most oak woodlands in Los Angeles County to the urban edge, these may be applicable.

Public benefits Source: Rosi Dagit

Urban Forest Effects (UFORE) is a computer model designed to characterize forest structure (species composition, number of trees, size, density, health, leaf area, biomass, diversity) and use these variable to evaluate primarily air quality parameters like removal of particulate matter, carbon sequestration and storage, temperature effects resulting in energy use benefits and pollen impacts (Nowak and Crane 2000).

STRATUM is the street tree management and analysis tool used by many local cities. Using commonly collected inventory data on tree species, size, health and location, the computer model calculates the dollar value of aesthetics, energy conservation, air quality improvement, carbon dioxide reduction, stormwater control and property value increases. The applicability of this model to oak woodland land use conversion is dependent on the location of the proposed development in relation to a more urbanized environment (USFS 2009).

Incorporating these elements into the assessment of costs of oak woodland loss that the community will assume will begin to provide a more realistic understanding of trade-offs between conservation and development.

Use Values

It is easier to put a dollar value on more concrete and tangible ways the oak woodland is used. These are categorized as *Use Values*. Properties having functional oak woodlands offer higher real estate benefits (amenity values) than comparable lands without oaks (Standiford 1999). Real estate development costs are usually considered here. The "soft" costs of design, permitting, marketing and

sales are added to the "hard" costs of grading, construction, infrastructure and utility establishment, mitigation and monitoring. These costs vary, but are typically passed on to the consumer.

Oak between homes Source: Christy Cuba

The Council of Tree and Landscape Appraisers "Guide for Plant Appraisal" is currently the most common method used to assess individual tree value. With a long history of use in legal circumstances, it provides a tool to calculate the value of a tree based on its depreciated replacement cost. The Replacement Cost Method uses the installed cost of an equivalent tree to estimate value. The trunk formula method is based on the assumption that a tree the size of the appraised tree could not be replaced in-kind with an available specimen of the same size. It relies on extrapolating the data from a smaller and more readily available nursery tree and increasing that cost proportionately for size. In both cases, the cost is then depreciated for factors such as species, location, and condition of the tree to arrive at an estimate of value.

A recurring controversy with this method is that it may generate values that exceed the real estate value of the land the trees occupy. This method does not attempt to incorporate any ecosystem service values.

Non-Use Values

Non-Use Values are those that do not derive from in-situ consumption of the resources (Kopp and Smith, 1993). Recreational opportunities provided by oak woodlands (hiking, bird watching, etc.) result in dollar benefits to local businesses, increase real estate value of adjoining properties, and are considered valuable by both local and long distance stakeholders. Travel costs to access an oak woodland open space, and willingness-to-pay for protecting oak woodlands are examples of methods used to identify how important these resources are in a contingency valuation setting.

After careful consideration, we recommend that property owners with parcels mapped in either the historic, present, or potential restoration oak woodland zones identified in this plan use the following

process for developing a assessment of how their actions will impact the functions of oak woodlands.

Total Oak Woodland Value = Use Values + Non-Use Values + Ecosystem Function Values

The extent of this evaluation will be dependent on the following conditions:

1. The land use change is proposed for a parcel located within the Oak Woodland zones (historic extent, existing, potential restoration)
2. Single family home parcels within an oak woodland are not subject to more than the Oak Tree Protection Ordinance UNLESS the proposed action requires a discretionary permit.
3. The oak woodland was planted or expanded by the property owner who can provide documentation

Oak Woodland Conservation Fund Contributions

There are several ways to decide upon suitable compensation to the residents of Los Angeles County for the loss of oak woodland resources. The simplest is to require that the amount of oak woodland lost be replaced by at least a 2:1 ratio, purchasing woodlands of comparable or better integrity for the public. Another strategy would be to use the cumulative CTLA values of the individual oaks within a woodlands as the basis for compensation. In cases where that value of the trees exceeds the value of the land, then the appraised value of the land could be used as the basis for identifying the compensation required.

Opportunities for Oak Woodland Restoration and Recovery

The task of restoring or enhancing oak woodlands is difficult, fraught with many obstacles. Mitigation planting of seedlings to replace the loss of mature oaks has not effectively addressed the magnitude of ecosystem services lost when functional oak woodland is reduced to isolated oaks trees stranded within a development. This should be the last mitigation strategy to be considered. Replacement oaks planted on cut or fill slopes usually struggle to survive. Under ideal

New installation of mitigation oaks
Source: Christy Cuba

conditions, it takes between 30 and 100 years for these seedlings to reach the same size as the mature trees that were removed. How can we compensate for the years of services lost while the seedlings grow?

If we want to restore lost oak woodlands or enhance those remaining, then we need to define our restoration goals. Do we want to replace lost aesthetic, amenity, ecological service or wildlife habitat values? We also need to know how to predict how many of the seedlings actually grow to the size of the oaks removed. What is the best way to incorporate the risk of loss or inadequate survival into our management plans?

These questions are not new. In fact, an OAK REVEGETATION STRATEGY for Los Angeles County was produced by Lyle and Safford (1997) (**see Appendix 5**) and provides a well thought out set of criteria for deciding when and where it makes sense to try to plant oak trees. This does not mean that oaks cannot successfully be restored in other locations, but it provides a valuable starting point for directing restoration actions.

Recovery of Oak Woodlands

Regeneration and restoration are considered appropriate mitigation strategies only in locations where the chance of success is reasonable. The costly and long-term effort to develop successfully restored oak woodlands should be undertaken only as a last resort to mitigate for removing oak woodlands, and cautiously when attempting to increase regeneration and longevity within degraded oak woodlands. Environmental benefits of attempted restoration include:

Coast live oak acorn sprouting after fire, Sylmar
Source; Christy Cuba

- *Species diversity and wildlife populations will increase.*
  Oak woodland constitutes much richer habitat than the scrub communities that have replaced it. Oaks are among species supporting the greatest diversity and largest numbers of wildlife.

- *Erosion control will be enhanced.*

  Flood waters and eroded soils flowing from foothills and lower mountain slopes into the urbanized valleys would decrease because oaks are less vulnerable to fire than most other native species when well maintained. They effectively hold soil in place and allow increased soil absorption of rainwater near where it falls. Oaks furthermore speed the processes of soil formation by retaining moisture in contact with the underlying rock.

- *Carbon dioxide absorption and oxygen production will increase.*

  This increase will be in increments that can be significant in improving the region's air quality, while reducing greenhouse effects.

- *Intensities of wildfires will likely be reduced.*

  In comparison with the heavily fueled, intense fires that are now common, newly established stands of oaks can form buffers between suburban areas and wildlands.

- *Recreational uses will be much improved.*

  Cool, shaded landscapes of oak woodland invite greater use.

Gorman woodlands Source: Ty Garrison

Oak Woodland Restoration Potential Model

It is important to recognize that the Oak Woodland (Restoration) Potential Model (Lyle and Safford 1997) presents a general pattern, not a precise delineation of sites. Its purpose was to provide a broad indication of areas within Los Angeles County where coast live oak woodland might be most easily and cost-effectively established. In fact, coast live oaks grow on all different solar aspects, but the model shows oaks growing much more frequently on some aspects than others. Thus, the distinction is a matter of "more or less", which leads to a general pattern and not to precise delineation.

Factors that need to be carefully evaluated prior to undertaking an oak woodland restoration include, but are not limited to; slope, aspect, elevation, soils and water availability. Using GIS modeling, Lyle and Safford identified several suites of variables that offer the best chance of success. A summary of their results are found in **Appendix 5.**

The Oak Woodland Restoration Potential Model presents an extremely complex pattern. The most extensive areas of highest and high potential for oak restoration are in the general area of the Santa Clara River valley. In inland areas west and south of the Grapevine (I-5) north of Santa Clarita, areas with high potential are fewer and are confined to larger canyons. There are numerous areas with high potential for oaks in the coastal zone, but these are smaller scale than those in the Santa Clara River valley.

Unmapped areas of high potential may exist below 300 meters in elevation at the base of the interior ranges. Most of the area available for study at this elevation had already been cultivated or developed by the time vegetation mapping was completed in the 1920's and is covered by suburban development today. Therefore it did not appear on the Weislander maps, which form the baseline used for this model. Most of the oak woodland still present occurs in the larger canyon openings of the interior ranges and along the perimeter of core habitats of public open space such as the Santa Monica Mountains National Recreation Area.

Potential Oak Woodland Conservation Areas

By using the following method, it is possible to identify locations within Los Angeles County where optimal conditions occur for oak woodland restoration. Restoration planting and voluntary conservation of parcels within these areas provides the best opportunity to expand and replace oak woodlands lost to development.

Criteria for designating a parcel as part of the Potential Oak Woodland Conservation Area include:

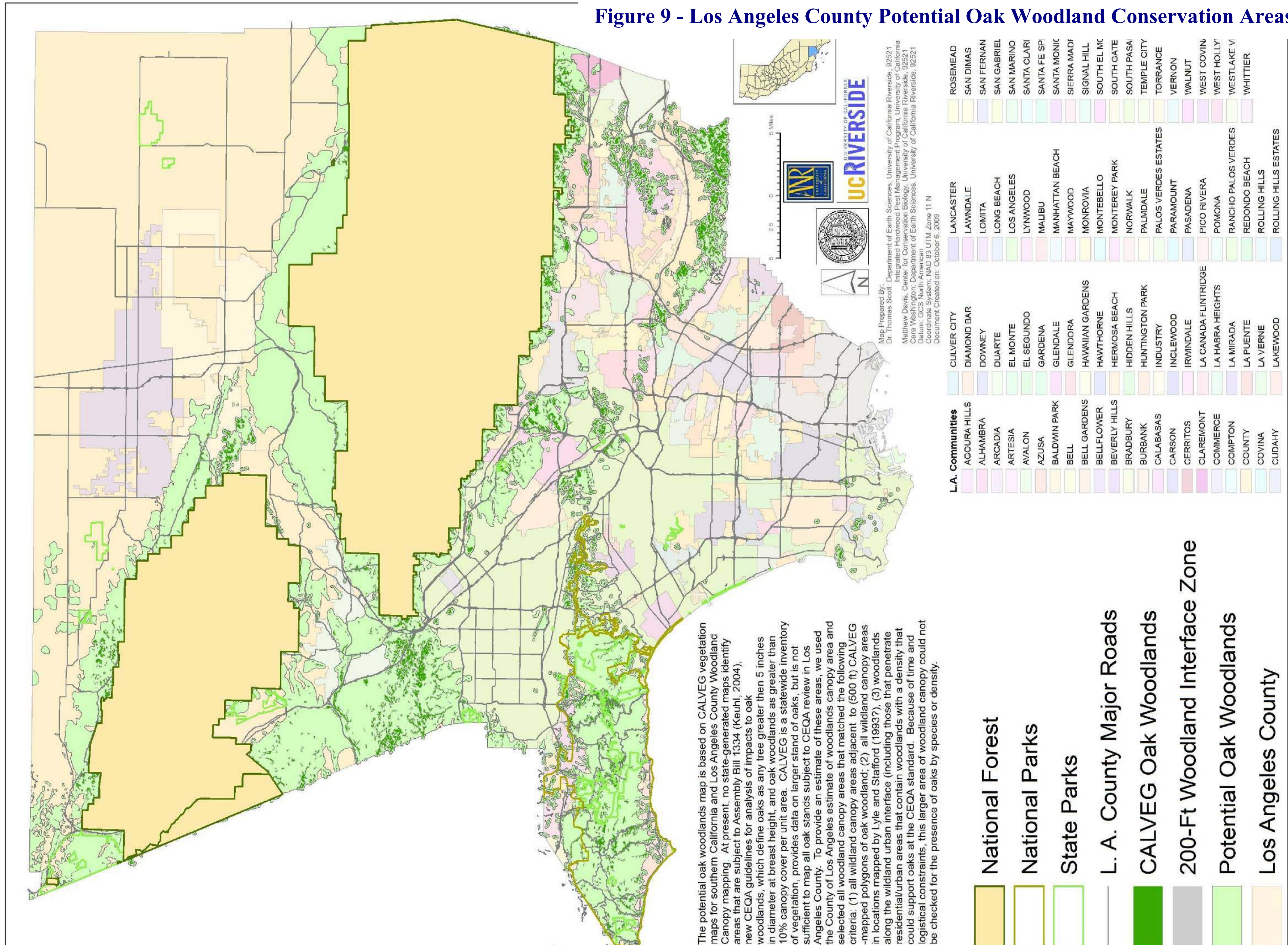
- Adjacent to core oak woodland habitat area (either public or private)
- Parcels that will improve connectivity and reduce fragmentation
- Parcels that will improve wildlife corridors and linkages, especially in riparian areas

- Parcels that meet suitability criteria for slope, aspect, drainage, etc. that would support restoration and regeneration.

Valley Oak woodland/savannah habitat is considered to be the highest priority for restoration and acquisition. **Figure 9** on the next page illustrates the approximate boundary of **Potential Oak Woodlands Conservation Areas in Los Angeles County**. This map reflects the best possible estimates using the large scale CALVEG overlay with a 200 foot buffer added. Parcels located within this mapped zone may have more potential for oak woodland restoration than areas not included, however, small pockets of significant oak woodland resources are found within the urbanized zones outside this boundary and depending on species and location may also be candidates for potential conservation and restoration. This figure represents a work in progress and will be revised following public input into the OWCMP.

Coast Live Oak and Valley Oak woodland, Calabasas
Source: Rosi Dagit

Figure 9 - Los Angeles County Potential Oak Woodland Conservation Areas



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Applying the Strategy for Oak Woodland Restoration

The following elements are an essential part of any Oak Woodland Restoration Plan.

Site Specific Application

Once a site has been identified as being within a potential restoration zone, then a parcel level analysis that incorporates specific factors such as fire history, geology, location and specific condition of existing oak woodland (stand age, diversity, health, etc.) will be needed.

Define Suitable Plant Associations

Each oak recovery project will include the community of plants associated with the oaks in that location. Selection and planting of oak associated understory plants shall be part of the restoration design.

Planting and Management Guidelines

The planting plan that includes layout, plant propagation and establishment goals needs to be developed. Random spacing and cluster configuration patterns should mimic nearby stands.

Replacing Oak Woodland Habitats

The ability to recreate any lost ecosystem is fraught with difficulty. The complexity and diversity of oak woodland habitats make them particularly problematic to restore to a self-sustaining, fully functional level. There are examples of successful oak tree planting, but there is currently no example of a successful oak woodland restoration in Los Angeles County.

A study done of the effectiveness of tree planting to mitigate habitat loss in a blue oak woodland used models to evaluate restoration of oak habitat using a variety of tree densities and management intensity (Standiford, McCreary and Frost 2002). Using data collected for ten years on a blue oak plantation, it was found that at the highest level of management and a planting density of 200 trees per acre, it would take ten years following planting to reach the ten percent canopy cover criteria for woodland under optimal site conditions.

This sobering reminder of the limitations of restoration planting underscores the need to retain existing functional oak woodlands.

Mitigation oaks as part of a riparian and upland system, Castaic Source: Christy Cuba

On-Site Mitigation Measures

On-site mitigation presents a host of problems. When there is insufficient space within a proposed development design to allow existing oak trees and woodlands to remain in their natural state, then the potential for having sufficient suitable space to replace those removed with two or more times that number of trees or acres of oak woodlands is unlikely. Typically, replacement planting done on site is in marginal locations, such as cut or fill slopes, within median strips or within fuel modification zones.

An informal survey of local arborists and foresters came up with very few success stories for individual tree replacement and none for successful restoration of fully functioning oak woodlands.

Mitigation measures should reduce the level of impacts, restore impacted resources or enhance degraded resources. Examples of on-site mitigation measures include, but are not limited to:

- Retaining mature trees with irreplaceable characteristics
- Maintaining snags that represent a variety of sizes, species and decay levels
- Minimize stormwater runoff
- Retain on-site groundwater recharge and percolation
- Protect stream crossings for fish passage and to reduce erosion and water quality degradation
- Designate areas appropriate for seedling/sampling recruitment or replacement
- Develop landscape plans that enhance native oak woodland associated species and preserve natural hydrologic patterns
- Remove invasive plants

Off-Site Mitigation Measures

When it is unfeasible to successfully implement required mitigation for loss of oak woodlands on a given parcel, then off-site mitigations are considered. This is consistent with the existing requirements of the LA County Oak Tree Protection Ordinance, which allows for the contribution of the value of the oaks to be lost to the County Oak Tree Fund. Oak values are calculated using the CTLA formulas and negotiated between the County and the property owner. The funds are intended for purchase of comparable acres of oak woodland that can be protected as public open space.

To date, it has been difficult to track these funds and identify when and where they have been successfully used to purchase oak woodlands. We hope that a better tracking and implementation system can be established to ensure that the mitigation monies are used in the most effective way possible.

It is important the County establish clear criteria for when off-site mitigation is appropriate to ensure that the strategy is not abused. The *Planner's Guide for Oak Woodlands* (2005) offers the following criteria for identifying suitable sites for this mitigation purpose:

- Sites will protect, promote or improve locally significant oak woodland resources
- Sites will improve or expand threatened species habitat
- Sites will reduce erosion or improve stream corridors
- Sites will maintain or improve habitat connectivity and biological integrity

Successful Monitoring Strategies

A key to documenting the success of the OWCMP is thorough monitoring. With the available GIS tools, the County should be able to adequately identify the expansion or loss of oak woodlands over time, as well as characterize the changes to these resources associated with development.

Off-site mitigation area, Castaic
Source: Ty Garrison

On a project level, monitoring needs to be clearly outlined so that the reports provided to the County provide sufficient detail to evaluate the effectiveness of required mitigations. Most of the projects that would require oak woodland monitoring potentially will require permits from the California Department of Fish and Game, US Army Corps of Engineers, Regional Water Quality Control Board or other state and federal agencies. While each of these agencies has specific requirements, the opportunity to develop a comprehensive monitoring plan that fulfills all these requirements is desirable.

At minimum, a successful monitoring plan should follow established guidelines, such as those provided by the Environmental Protection Agency (EPA). These include, but are not limited to:

- Describing the baseline condition of the site
- Describe the mitigation measures to be implemented
- Identify measurable performance standards and a timeline
- Describe how these performance standards will be documented
- Describe an adaptive management strategy for dealing with problems
- Provide a monitoring schedule
- Identify a person or agency responsible for the on-the ground monitoring
- Provide for reporting, organizing and managing data collected
- Identify and provide adequate funding
- Identify enforcement issues
- Identify contingency measures

Monitoring installations, Sylmar
Source: Christy Cuba

Long-term Stewardship and Management of Oak Woodlands

Stewardship is the cooperative planning and management of resources, such as oak woodlands, with interested parties and agencies actively participating in the protection of loss of a habitat and finally toward its recovery by long-term sustainability. For oak woodlands occurring on private properties, stewardship would consist of the conservation of the resources present with the objective to promote the natural processes, allowing the habitat to self-perpetuate in perpetuity.

Scrub oaks, Santa Clarita Source: Ty Garrison

Long-term stewardship is a component of all aspects of the oak woodlands decision-making processes, where mitigation strategies are designed that are practical and permanent, generating habitat of equal or greater functional value to what was destroyed.

Stewardship Goals

Long-term stewardship is a county-wide responsibility and should be incorporated into relevant County land use planning policies, practices and systems. Partnerships between Los Angeles County and individuals (e.g., property owners) and organizations (e.g., Santa Clarita Oak Foundation, Mountains Restoration Trust) to conserve and enhance oak woodlands is encouraged.

Because one of the goals of the Los Angeles County Oak Woodlands Conservation Management Plan is the protection of public health and environment, public participation and education is part of a long-term stewardship program. Increasing public awareness of the value of oak woodland habitat, carbon sequestration, watershed protection, air quality, and psychological benefit is part of that endeavor.

Advanced stewardship incentives would include cost sharing of resource management or other incentive payments such as tax breaks, carbon credits, landowner assurances for development uses.

Stewardship Policies

Los Angeles County should support and encourage voluntary, long-term private stewardship and conservation of California's oak woodlands by offering landowners financial incentives to protect and promote biologically functional oak woodlands.

Los Angeles County should encourage land use planning that is consistent with the stewardship and conservation of oak woodlands.

Los Angeles County should encourage clustering of houses and other development that avoids habitat fragmentation and disruption of oak woodlands and associated wildlife corridors.

Los Angeles County and resources organizations should provide educational and oak resource support programs that assist the private property owners in the management and stewardship of their oak woodlands and associated wildlife habitats.

Stewardship Implementation

The Los Angeles County OWCMP focus is on preserving existing oak woodlands, focusing development in areas which will have the least impact on oak woodlands or other sensitive ecosystems, and identifying Priority Oak Woodland Conservation Areas to offset the loss that will inevitably occur. This comprehensive planning effort which evaluates the oak woodlands within the context of several spatial scales (parcel, watershed, landscape) provides the County with the opportunity to more accurately track and assess cumulative impacts associated with any proposed development.

IV. OPTIONS FOR OAK WOODLAND CONSERVATION AND RECOVERY

GENERAL PLAN POLICY RECOMMENDATIONS

The Los Angeles County Board of Supervisors, the Forestry Division of the Los Angeles County Fire Department, and the Department of Regional Planning have actively supported the development of the Los Angeles County Oak Woodlands Conservation Management Plan as a means of improving and codifying the County's efforts to preserve, enhance and restore oak woodlands. One of the key methods of ensuring that the concepts of the Los Angeles County OWCMP will be put into action is incorporating them into the County's General Plan.

This is critical because the land use and infrastructure decisions made by the County will have a profound and permanent impact on the viability-or lack thereof- of the County's remaining oak woodlands. A valuation of the contribution of oak woodlands toward carbon sequestration and other climate change-related benefits may also be included in the section of the General Plan addressing Air Resources and Climate Change.

As the General Plan evolves, oak woodlands considerations should be incorporated as appropriate into a variety of elements such as:

- **Land Use**
  Zoning designations, setbacks, restrictions
- **Mobility** (Transportation & Access)
  Road development and maintenance impacts
- **Air Resources**
  Benefits of oak woodlands in mitigating air pollution
  Carbon sequestration benefits
  Climate change benefits
- **Conservation and Open Space**
  Recreation and public health benefits
  Significant Ecological areas

Placerita Canyon utilities
Source: Ty Garrison

Woodlands and forests

Relationship between agriculture and oak woodlands

Scenic Resources

Water quality benefits

- **Noise**

  Buffers provided by oak woodlands

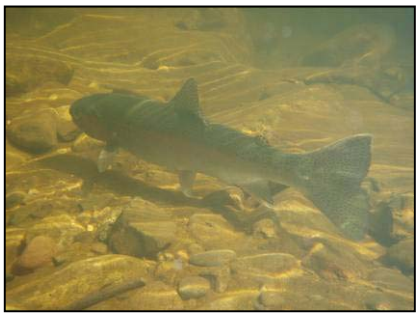
- **Safety**

  Flood hazard reduction benefits

  Fire hazard reduction benefits

- **Public Services and Facilities**

  Groundwater recharge benefits



Steelhead in Malibu Creek
Source: Rosi Dagit

Natural recharge area , Santa Clarita
Source: Christy Cuba

Specifically, Goals, Policies and Action Items explicitly addressing the following issues should be incorporated into the draft General Plan's "Conservation and Open Space Element" prior to the time the draft is first officially considered by the Regional Planning Commission. The Goals should set broad policy objectives and govern the interpretation of individual policies. Policies should implement each of the Goals. Together, the Goals and Policies should create a firm policy foundation for the preparation of ordinances, programs, and other Action Items that will implement the plan. Specific Action Items with measurable timeframes should be identified as part of the general plan process.

Goals

The General Plan should set firm goals toward the preservation, enhancement and restoration of oak woodlands. Recommended goals include:

GOAL No net loss of oak woodland.

GOAL Comprehensive mapping of all oak woodlands including a prioritization of relatively intact oak woodlands for preservation and those that are most at risk of degradation and that therefore require special protection.

GOAL Incorporation of existing oak woodlands into thoughtfully designed and appropriately scaled developments.

GOAL Seek connectivity with chaparral, grassland, pine or riparian habitats.

GOAL Prioritize restoration and recovery of valley oak and Engelmann oak woodlands.

GOAL Preserve viable oak woodlands that include a diversity of age structure of oak trees, especially large old oaks, and represent the diversity of oak woodland types. Viability should be measured by the presence of landscape variables (e.g. patch size, shape, connectivity) that adequately support the desired populations of oak dependant species;

GOAL Manage in such a way as to protect or restore natural ecosystem processes, including fire regimes, hydrologic regimes, oak regeneration and understory components of oak woodland systems;

GOAL Coordinate the restoration of oak woodlands with adjacent or connected ecosystem restorations, such as the replacement of non-native annual grasses with native perennial grasses, riparian restoration plans, etc.

GOAL Provide funding and technical assistance for oak woodland recovery efforts that achieve multiple benefits.

GOAL Coordinate the Oak Woodland Conservation Management Plan with other relevant County Plans and encourage cities within the County to adopt comparable protection standards.

Policies

The following policies should be considered by the Department of Regional Planning for inclusion in the County's draft General Plan:

POLICY Train planners, engineers and other relevant County staff to consider the impacts to oak woodlands resulting from land conversion, including infrastructure expansion or urban and suburban residential development. Training should also be provided concerning the CEQA thresholds of significance related to SB 1334 and to the potential carbon sequestration changes as per the Forest Policy Protocol.

Source: Rosi Dagit

POLICY Require developers to consider the protection of oak woodlands and other sensitive resources early in the scoping process.

POLICY Support efforts to protect existing individual oak trees and plant new oak trees in urban areas that were historically oak woodlands.

POLICY Where a proposed development would remove or degrade identified oak woodlands, first priority shall be given to redesigning the development to avoid those impacts. Replacement of lost woodlands shall be a secondary mitigation alternative that is to be used only where the Regional Planning Commission determines that avoidance of the impacts is not feasible.

POLICY Require developments undergoing CEQA review to develop and evaluate alternative designs that preserve and protect the resources.

POLICY If the proposed development cannot avoid removing or degrading identified oak woodlands, then the second priority would be to acquire acres of oak woodland of equal or greater habitat quality at a ratio of 2:1 to be placed into either a conservation easement or other deed restriction, or simply dedicated to the public trust.

POLICY Develop site-planning guidelines to assist planners and developers in integrating oak woodlands successfully into project development. Encourage or require alternatives that preserve the oak woodland and still meet the objectives of the project.

POLICY Los Angeles County Department of Public Works and all utility companies should be required to adhere to the policies and requirements of the Oak Tree Protection Ordinance when developing plans to expand existing infrastructure or develop new infrastructure if the infrastructure project will result in impact to more than 10% of a mapped Oak Woodland.

POLICY On-site replacement plantings for removal of oak woodland canopy shall only be considered as a last resort and must replace lost canopy at a ratio of at least 2:1.

POLICY Where oak woodlands need to be replaced, Oak Replacement Plans prepared by a qualified professional shall be prepared.

POLICY Oak Replacement Plans should include the following elements: proven suitability of the site for oak woodlands; long-term viability of that site as a conservation area; planting plans that are consistent with recognized standards such as those presented in

the IHRMP publication; a mix of species and density of oaks similar to what would be found in a healthy oak woodland indigenous to the location of the replacement planting; specify that species will be of local genetic material and maintain local genetic strains; and long-term management and maintenance plans.

POLICY Priority should be given to on-site restoration. Where on-site restoration is not feasible or the Planning Commission determines that on-site restoration would not be the best method of ensuring the long-term health of the oak woodland, off-site locations mapped by the Los Angeles County OWCMP as Potential Oak Woodland Conservation Areas should be given first priority.

POLICY Off-site restoration may be accomplished by any one of the following measures:

a. Acquiring an off-site conservation easement for functional and proportional oak woodland of similar or higher quality.

b. Contributing to the LA County Oak Fund at a 2:1 ratio based on the space needed (acreage or parcel) to replace woodland removed. The contribution should include provision for revegetation, maintenance[MSOffice3][MSOffice4], and monitoring[MSOffice5].

c. Replacement planting, together with maintenance and monitoring for seven years, either on-site or off-site at a location identified by the Los Angeles County OWCMP Potential Restoration & Conservation Area maps at a ratio of 2:1.

POLICY Incentives should be developed based on the "Incentives for Conserving Oak Woodlands" chapter of this plan that will encourage developments to exceed the minimum preservation and restoration standards established by this  n and its implementing ordinances. Specific incentives may include bonuses to development footprint, transfer of development rights, permit streamlining, and taxation advantages.

POLICY Oak woodlands that have been identified within Potential Oak Woodland Conservation Areas should be given early consideration by Trustee Agencies and non-profit organizations whose mission is to preserve natural lands in perpetuity.

Implementation Actions

Specific CEQA thresholds should be established to determine how to evaluate potentially significant environmental impacts to oak woodlands beyond the impacts to individual trees. It is recommended that the following process for identifying thresholds of significance, modified from the Oak Woodland Impact Decision Matrix (Guisti et al 2008) be considered.

Impact Magnitude Evaluation

1. What is the spatial extent of the proposed action on the site scale?
   - Metrics could include: changes in road density, percent canopy cover and number of oak species present pre and post development.

2. At the landscape scale, would the proposed action cause fragmentation, loss of connectivity or changes to ecosystem functions within a larger geographic area?
   - Metrics could include: changes in road density within 1 km of the site, distances between development and woodlands, changes in woodland size and configuration increasing patches and edge effects, impacts to wildlife corridors, increased fire risk, changes to hydrology.

3. Will the proposed action cause long-term impacts to the oak woodland structure and ecosystem services?
   - Metrics could include: duration of proposed impacts, future consequences such as reduced regeneration, increased exotic weed cover, increased fire frequency or fuel modification clearing.

Table 9 - Impact Prediction Checklist			
Criteria for determining significance of a proposed project. **Mitigation measures cannot ensure against long-term changes affecting the ecological processes and services. Therefore, any of the following occurrences can result in potentially significant impacts.**	**Significant for Intact Woodlands**	**Significant for Moderately Degraded Woodlands**	**Significant for Severely Degraded Woodlands**
Net loss of oak woodland acreage	X	X	
Increased habitat fragmentation	X	X	
Loss of vertical and horizontal structural complexity	X	X	
Loss of understory species diversity, locally uncommon or rare species or associations	X	X	
Loss of food sources for wildlife	X	X	
Loss of nesting, denning, burrowing, hibernating and roosting structures	X	X	
Loss of habitats and refugia for sedentary species and those with special habitat requirements, i.e. mosses, lichens, rocks, native grasses and fungi	X	X	
Road construction, grading, trenching, activities affecting changes in grade, other road-related impacts	X	X	
Stream crossings, culverts, and road associated erosion and sediment inputs	X	X	
Loss of riparian function, reduced bank stability and increasing sedimentation or water temperature that impacts native fishes and other aquatic species	X	X	
Road building activities that aggravate existing conditions		X	
Changes in environmental conditions that prevent existing residual trees from natural regeneration		X	
Proposed project designs that result in construction that poses barriers to wildlife or fish passage	X	X	
Proposed project designs that result in the probable introduction or expansion of invasive plants and animals	X	X	
Loss of individual heritage trees that are recognized and/or protected by ordinance or statutes	X	X	X
Loss of appropriate recruitment sites for recognized and/or protected heritage tree species	X	X	X
Loss of individual trees where the natural occurrence and range of the species has been dramatically reduced and altered resulting in decreased recruitment/restoration potential for the species	X	X	X
The removal of even a few individual trees that represents a significant portion of the existing population of that species	X	X	X
Loss of ecosystem services such as groundwater recharge, erosion protection, water quality protection, temperature moderation	X	X	X
Changes to carbon sequestration potential	X	X	X
Loss of viewshed, aesthetics, amenity value, public recreation opportunities, historic or cultural resources	X	X	X

Scenarios that may be less than significant may include:

- Removal of a small number of immature trees for a road widening project
- Removal of a single tree from a residential property associated with a remodeling project
- Actions associated with tree care, maintenance and health, such as pruning, shaping, etc.
- Removal and replacement of street trees
- Removal and replacement of landscape trees associated with existing developments.
- Removal of hazard trees where the threat of tree failure could injure people or property.

Hazardous tree in urbanized remnant woodland
Source: Christy Cuba

Following evaluation of the above checklist criteria, significance would be determined depending on the existing site condition, the degree to which the condition will be changed by the proposed action, and the location of the site with respect to the Potential Oak Woodland Conservation Areas. **Table 10 – Decision Matrix Determination of Significance Concept** illustrates this idea. **Table 11 - Impact Level and Initial Site Condition Matrix,** on the next page, provides an example of the possible matrix that could be used by planners to assist in the ranking of a potential impact level of significance.

Table 10 - Decision Matrix Determination of Significance Concept (From Guisti et al 2008)

		Site Condition	
Degree of Impact	**Undisturbed Intact**	**Moderately Degraded**	**Severely Degraded**
Low	Moderately significant	Least likely significant	Least likely significant
Moderate	Highly Likely significant	Moderately likely significant	Least likely significant
High	Significant	Highly Likely significant	Most likely significant

Table 11 - Impact Level and Initial Site Condition Matrix (Modified From Guisti et al 2008)			
		Initial Site Condition	
Impact Level	**Intact Woodland**	**Moderately Degraded Woodland**	**Severely Degraded Woodland**
Low	Minimal disturbance to stand structure and composition and habitat features resulting in no increased edge habitat or fragmentation; road and stream crossings are not being considered; activities will not result in the introduction of exotic or invasive species. [Minimal site or spatial disturbance may still result in significant impacts to an intact or core woodland]	Regeneration potential is being maintained across the site; understory oak associates present or can be restored; expansion of developed areas are centralized; new road and stream crossings not being considered. [In the absence of special circumstances, statutes or ordinances, this may represent a non-significant impact.]	Majority of remnant trees are retained; understory removal or road widening protects existing tree health; no further loss of ecosystem services considered. [In the absence of special circumstances, statutes or ordinances, this may represent a non-significant impact.]
Moderate	Detectible change or reduction in canopy, structure or composition; loss of some habitat features, subtle impacts increasing fragmentation, edge creation or loss of connectivity (fences, roads, other artificial barriers or buffers). [These impacts are considered significant.]	Regeneration potential is being marginalized; developed areas expand into previously undeveloped areas; new roads or stream crossings proposed; habitat features are being lost; activities will add exotic and invasive species. [These impacts are considered significant.]	Loss of a majority of existing trees; activities will inhibit or harm residual tree health and vigor; barriers constructed will increase fragmentation; ecosystem services will be lost or degraded. [These impacts are considered significant.]
High	Obvious change or reduction or loss of canopy, structure or composition; loss of existing habitat features; fragmentation and parcelization of contiguous ownerships; introduced roads, stream crossings and/or exotic invasive species; creation of edge effects; construction of barriers (fences, roads, etc.) [These impacts are considered significant.]	Large scale impacts including loss of habitat, understory, resulting in fragmentation and increased edge effects; Loss of woodland structure and changes in composition in large continuous woodland patch. [These impacts are considered significant.]	Loss of remnant trees or stand increases fragmentation across the landscape through loss of connectivity. [These impacts are considered significant.]

Public Outreach and Education

- Los Angeles County should develop and distribute guidelines to assist landowners and developers, utilizing best management practices, to recognize alternatives to oak tree removal, root system compaction, fill placement near trunk bases, landscape irrigation, road construction, and other conflicts that may arise during construction.

- The County could work closely with the American Institute of Architects (AIA) and the American Society of Landscape Architects (ASLA) to educate them about oak woodland conservation and to promote low impact or creative design development within oak woodlands.

- The County should make use of existing available support documents for oak woodlands management to private landowners, such as through UC Extension, Wildlife Conservation Board, etc. Examples include *Guidelines for Oak Woodlands Management* and *Regenerating Rangeland Oaks in California*.

- The County could conduct workshops, seminars, and other outreach activities for the general public and developers.

- Coordinate to provide oak woodland conservation information to various County departments including Regional Planning, Public Works, Parks and Recreation, and Fire.

- The County could create a stewardship program called Oak Guardians, similar to the Audubon California Landowner Stewardship Program, that works with private landowners to conserve, restore and enhance oak woodland habitat and associated wildlife in a manner compatible with existing land use operations.

- Restoration efforts could provide erosion control, planting of oak seedlings, establish appropriate fencing around plantings and important resource areas, planting native perennial shrubs and grasses, and the control of non-native invasive weed species that may inhibit seedling establishment and survival. The County could partner with the California Native Plant Society and the National Arbor Day Foundation in the procurement of appropriate plant materials.

- The County needs ongoing interaction and exchange with stakeholders. Encouraging participation from all parties facilitates informed decision-making and increases the likelihood of successful implementation of long-term stewardship.

Partnerships

Achieving conservation of oak woodlands depends upon the concerted effort of all the stakeholders within Los Angeles County, including public land managers and its cities. Leveraging the expertise and resources of these stakeholders is an effective way for the County to achieve the goals promoted by this plan. Establishing ties to local colleges and universities, along with public and private schools would tap into numerous opportunities for educational outreach. Los Angeles County could partner with numerous local agencies, non-profits and community group including, but not limited to:

Arroyo Seco Foundation	Audubon Society
Building Industry Association	California Oak Foundation (COF)
California Department of Fish and Game (CDFG)	California Department of Parks and Recreation (CDPR)
California Native Plant Society	California Urban Forest Council (CUFC)
Community ReLeaf	International Society of Arboriculture (ISA)
Hollywood/Los Angeles Beautification Team	Los Angeles and San Gabriel River Watershed Council
Los Angeles Community Forest Advisory Committee	Los Angeles County Arboretum
Malibu Creek Watershed Council	Mountains Restoration Trust (MRT)
Mountains Recreation Conservation Authority (MRCA)	National Park Service (NPS
Santa Monica Mountains National Recreations Area (SMMNRA)	Natural Resources Conservation Service (NRCS)
North East Trees (NET)	Pasadena Beautiful Foundation
Rancho Santa Ana Botanical Garden	Resource Conservation District of the Santa Monica Mountains (RCDSMM)
Save Open Space (SOS)	
Santa Monica Mountains Trail Council (SMMTC)	Shade Tree Partnership
Sierra Club	Southern California Association of Governments
Street Tree Seminar, Inc.	Topanga Creek Watershed Council
Tree Musketeers	TreePeople
U.S. Forest Service -Angeles National Forest	West Hollywood Tree Preservation Society

Other Recommendations

- Evaluate the effectiveness of the Los Angeles County Oak Woodland Conservation Management Plan within 3-5 years following implementation and revise as necessary.

- Develop performance criteria so that the effectiveness of the Plan in meeting County goals can be adequately characterized.

- Work with local partners to establish a standard protocol for accepting, managing and monitoring oak woodland conservation easements.

- Los Angeles County could allow for density bonuses and transfer of development rights as a means to achieve oak woodland conservation and preservation.

- Develop a program to conserve and enhance local oak genetic resources and make locally grown oak planting stock available.

- Work with Caltrans and LA County Road Department to identify protection and enhancement opportunities along state and county roads traversing oak woodlands, such as Highway 2 (Angeles Crest Highway), Highway 27 (Topanga Canyon Blvd.), Malibu Canyon/Las Virgenes Road, Mulholland Highway, and others.

The *Oak Woodland Bird Conservation Plan* (2002) also highlights a suite of recommendations related specifically to the use of oak woodlands by birds including:

- Prioritize oak woodland sites for protection
- Increase acreage of protected oak woodlands
- Identify sites with intact oak regeneration and decay processes.
- Sites should include diverse age structure of oak trees, especially large old oaks
- Represent diversity of oak woodland types

- Seek connectivity with chaparral, grassland, pine or riparian habitats
- Incorporate landscape variables (patch size, shape, connectivity) that adequately support the desired populations of oak dependant species
- Manage in such a way as to protect or restore natural ecosystem processes, fire regimes, hydrologic regimes, etc.
- Restore oak regeneration and understory components of oak woodland systems
- Replace non-native annual grasses with native perennial grasses
    - Restore upland oak woodland habitat in conjunction with adjacent riparian restoration.
    - Pruning should not remove more than 15% of the living canopy and timing of deadwood removal should consider potential for nesting birds.

Certification

In order for Los Angeles County to qualify for potential funding by the Wildlife Conservation Board to assist with the acquisition of oak woodland conservation easements or titles, the County must certify that any project that is proposed for funding is consistent with this conservation management plan. The County will need to establish a system to document those projects that qualify.

DEFINITIONS

BMP – Best Management Practice

Canopy – The total foliage spread or cover of a tree. Such spread includes leaves, twigs and branches.

CARB – California Air Resources Board

CEQA – California Environmental Quality Act

Conservation easement – A deed restriction landowners voluntarily place on the property to protect land.

Conversions – A generic term for situations in which forest lands become used for non-forest uses, particularly those uses that alter the landscape in a relatively permanent fashion.

CTLA – Council of Tree and Landscape Appraisers

Damage- Any act causing or tending to cause injury to the root system or other parts of an oak tree, including, but not limited to, the acts of burning, pruning, cutting, application of toxic substances, operation of equipment or machinery, paving, construction, changing the natural grade, and trenching of excavation with the protected zone of an oak tree.

Deadwood – Limbs or branches that contain no green leaves or live tissue. A tree or limb may be considered dead if it does not show evidence of any green leaves or live branches over the span of one year, inclusive of prime growing weather.

DBH – diameter of the trunk measured 4.5 feet above natural grade

Dripline – A vertical line extending from the outermost portion of a tree canopy to thee ground. When depicted on a map, the dripline will appear as an irregular shape that follows the contour of the tree's branches as seen from overhead.

Ecosystem - An ecological community of organisms together with its physical and chemical environment, functioning as a unit. There is a complex set of relationships among the living resources, habitats, and residents of an ecosystem.

Ecosystem functions - Plants and animals' interactions with one another may perform important functions, such as decomposition, nutrient cycling, pollination, and seed dispersal. These cohesive processes hold the ecosystem together and maintain it as self-perpetuating.

Ecosystem services - Humankind benefits from a multitude of resources and processes that are supplied by natural ecosystems. Collectively, these benefits are known as **ecosystem services** and include products like clean drinking water and processes such as the decomposition of wastes.

Edge effects – Impacts to native flora and fauna related to proximity to developed areas.

Encroach – Any act which damages an oak tree and/or to conduct any activity within the protected zone of any oak tree, including, but not limited to: 1) construction and placement of permanent, semi-permanent or temporary structures; 2) grading; and 3) any single instance, repeated or permanent activities that would result in compaction of soils, such as parking ,storage, etc. as determined by the director or the County forestry.

ERB—The Environmental Review Board is an advisory committee to the County consisting of 9 professionals with technical expertise in resource management. The ERB for Los Angeles County reviews development proposals in the sensitive environmental resource areas of the unincorporated Coastal Zone of the Santa Monica Mountains. The recommendations are intended to ensure that development in these areas is consistent with the resource protection policies of the (Malibu) Land Use Plan.

ESHA – Environmentally Sensitive Habitat Area

Forest land – Land that can support 10% native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits.

Fragmentation – Breaking up contiguous land cover with smaller parcels separated by varying distances.

GHG- Greenhouse gas

Habitat – the place or environment where a plant or animal naturally lives and grows.

Heritage tree – A protected oak that has any of the following: a) at least one tree trunk measuring 24 inches or more in diameter, as measured at four and on-half feet above mean natural grade; or b) a combination of any two trunks measuring a total of 34 inches or more in diameter, as measured at four and on-half feet above mean natural grade. Any oak tree that is identified on the Federal or California Historic Resource Inventory to be of historical or cultural significance.

Intact Oak Woodland - Site is currently in a "wild" state where all ecological functions such as groundwater infiltration, shade, habitat, nutrient cycling, carbon sequestration, wind/noise/dust abatement, and the stand is self-sustaining and regenerating.

IHRMP- Integrated Hardwood Range Management Program

Landowner – An individual, partnership, private, public, or municipal corporation, Indian tribe, state agency, county or local government entity, educational institution, or association of individuals of whatever nature that own private forest lands or woodlands.

Mitigation measures – Actions included in a proposed project's environmental impact report (or other CEQA document) that reduce or eliminate a significant environmental effect.

Moderately Degraded Oak Woodland - Even though the site has been altered, oak woodlands persist and retain some of their functions. Natural regeneration is possible, wildlife use still occurs, and some level of ecosystem services are still present.

Monitor – A qualitative or quantitative, or both documentation of existing conditions of a site.

NRCS- Natural Resource Conservation Service

Oak tree – Any tree of the species *Quercus* native to Los Angeles County.

Oak Tree Protection Ordinance – County ordinance protecting all indigenous oaks (*Quercus* species) found in Los Angeles County that are over eight (8) inches in diameter as measured four and one-half feet above mean natural grade.

Oak Tree Permit – a permit issued by the County of Los Angeles for purposes of pruning branches larger than 2 inches and/or removal of oak trees 8 inches or larger diameter at 4.5 feet height above the ground.

Oak Woodland – Oak Woodland Conservation Act (Fish and Game Code 1361) defines an oak woodland as an oak stand having greater than 10 % canopy cover, or that may have historically supported greater than 10% canopy cover. Also defined using AB242: "an oak stand with greater than 10% canopy cover, or that may have historically supported greater than 10 percent canopy cover" in the stand. (Greater than 10% canopy cover within the tree stand of oaks shall be considered an "oak woodland" for planning purposes. Final definition will depend on other conditions of the habitat.)

"Oak woodlands" SEA—Significant Ecological Area, an area designated in Los Angeles County on the special management areas map of the general plan for special consideration of preservation of biological resources in planning for development

Potential: the highest ecological status an area can attain given no political, social, or economical constraints; often referred to as the "potential natural community (PNC)".

Potential Oak Woodland Conservation Areas – Locations within historic and existing oak woodlands areas where restoration actions could be implemented.

Protected oak tree- A live native oak tree (*Quercus* genus) indigenous to southern California with at least one trunk measuring eight inches or more in diameter. Protected oak trees include those that have been planted as a requirement of a county permit or code, regardless of the trunk diameter.

Protected zone – The surface and subsurface area of a protected oak tree that lies within the dripline of such tree, plus the area extending to a minimum of five(5) feet beyond the dripline, or fifteen (15) feet outward from the outsider perimeter of the trunk of such tree, whichever is greater.

Pruning – The removal of a portion of an oak tree's shoots, branches, limbs or roots.

Public Resources Agency – A government or non-profit agency that has the authority to manage, preserve or enhance public resources for the benefit of the County and its residents.

Remove – Any act to cut down or destroy any oak tree or to encroach upon any protected oak tree beyond a reasonable expectation of recovery, as determined by the County forester. Relocation of protected oak trees shall be considered removals.

Severely Degraded Oak Woodland - These sites have been drastically altered from the natural condition to accommodate residential, commercial or industrial uses, and oak woodlands remain in scattered locations. Natural regeneration is not possible. Soil is compacted, contaminated or paved. Wildlife habitat is limited and associated understory vegetation has been replaced by managed non-native landscaping.

SEATAC—Significant Ecological Area Technical Advisory Committee, a committee of 7 professionals that advises the County on planning development in the SEAs. Applicants prepare an extensive Biological Constraints Analysis and then a Biota Report for the SEATAC. The reports present impacts and suggested mitigations for development in the SEAs.

SERA – Sensitive Environmental Resource Area

Significant Oak Woodlands – Areas designated only in the (Malibu) Local Coastal Plan, which guides planning decisions in the unincorporated Coastal Zone of the Santa Monica Mountains. A closed canopy has generally been understood to be an oak woodland in the Coastal Zone, but this is not codified, and savannahs are equally noted as being significant.

Significant Watershed - "Relatively undisturbed watershed areas containing undisturbed riparian and oak woodlands (or savannas) and recognized as important in contributing to the integrity of these woodlands."

Stand – A group of two or more trees growing in a contiguous pattern.

Threshold of Significance – that level at which the Lead Agency finds the effects of the project to be significant. The thresholds are often defined by ordinance or by precedent.

Understory – The area found beneath the dripline and protected zone of an oak tree.

Wildlife Corridor – Land area linking two habitats, providing cover and habitat stepping stones for many kinds of wildlife. Also referred to as wildlife linkages.

Woodlands – Forest lands composed mostly of hardwood species such as oak.

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Los Angeles County Oak Woodlands Conservation Management Plan

APPENDICES

October 27, 2009

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APPENDIX 1

PROPOSED REVISIONS TO LOS ANGELES COUNTY PLANNING APPLICATIONS & FORMS

(preliminary)

Draft prepared by:
Christy Cuba
w/LACOWHCSA Input

PROPOSED NEW QUESTIONS FOR THE

L. A. COUNTY SITE PLAN REVIEW APPLICATION

Is the proposed project located within mapped County Oak Woodland Area Overlay? (Planner pulls up on-line map and looks with applicant based on property APN(s)) The online map of the overlay will be available to the public, too, on the Regional Planning & Fire/Forestry Dept websites)	**Yes** ☐ **No** ☐ **Maybe** ☐
Is there more than one native oak of any size on the property or located within 200 feet of the protected zone of oaks on adjacent properties? (Planner reviews site and surrounding property photos provided by the applicant at the counter – photos will be required at this stage – and compares them to a photographic guide to oaks of L.A. County that they will have at the desk and/or online. Online version will also be available to public) – if photos are not available, and an on-line map does not illustrate otherwise (i.e., Google Earth or other easily-accessed program) the planner will check "Maybe"	**Yes** ☐ **No** ☐ **Maybe** ☐
If the answer to either of these questions is yes or maybe, then the applicant would be asked to work with the planner to answer the following additional questions: (the average applicant would need some preliminary reports on the site conditions to help answer these questions…)	
What is the cover and number of trunks 5" or greater of all native oak tree species on the parcel? NOTE: Tree cover = mapped canopy dripline + 15 feet (protected zone) The extent of the woodland should be identified on a 500 foot radius map at 1"=100' scale as is currently required by the Oak Tree Permit Application	Approximate # Trunks _____ Canopy cover area _____ ☐ ft^2 ☐ ac.

Calculate the percent of the parcel area covered with oak canopy plus the protected zone.	Percent _____
Does the oak woodland on this property or within 200 feet meet the state definition of oak woodland, having a "stand with greater than 10% canopy at present or historically" (CDFG)? **For the purposes of this plan, we are using the County Oak Woodland Overlay Zone Map showing locations of known oak woodlands.**	**Yes** ☐ **No** ☐ **Maybe** ☐
Is the stand within 200 feet of another oak stand?	**Yes** ☐ **No** ☐ **Maybe** ☐
To your knowledge, has the parcel burned? If so, describe when, extent, etc.	**Yes** ☐ **No** ☐ **If yes, when?** _____
To your knowledge, has the site been grazed? If so, describe.	**Yes** ☐ **No** ☐ **Description** _____
To your knowledge, are there any special habitat areas or features including but not limited to drainages, seep, springs, etc.. If so, describe.	**Yes** ☐ **No** ☐ **Description** _____
What is the current zoning for the site?	**Zone(s)** _____
Is zoning or land use change that would impact the oak woodland being proposed?	**Yes** ☐ **No** ☐ **Maybe** ☐

SAMPLE OF PROPOSED REVISIONS FOR

LA COUNTY INITIAL STUDY QUESTIONNAIRE

RESOURCES - 3. Biota/Oak Woodland
SETTING/IMPACTS

	Yes	No	Maybe	
a.	☐	☐	☐	Is the project site located within a Significant Ecological Area (SEA), SEA Buffer, or coastal Sensitive Environmental Resource (ESHA, SERA, etc.), or is the site relatively undisturbed and natural?
b.	☐	☐	☐	. Will grading, fire clearance, or flood related improvements remove substantial natural habitat areas or change the hydrologic regime of the site?
c.	☐	☐	☐	Is a drainage course located on the project site that is depicted on USGS quad sheets by a dashed blue line or that may contain a bed, channel, or bank of any perennial, intermittent or ephemeral river, stream, or lake?
d.	☐	☐	☐	Does the project site contain a major riparian or other sensitive habitat (e.g. coastal sage scrub, oak woodland, sycamore riparian, woodland, wetland, etc.)?
e.	☐	☐	☐	Does the project site contain oak or other unique native trees (specify kinds of trees)?
f.	☐	☐	☐	Is the proposed project located within mapped L.A. County Oak Woodland Overlay or buffer zone?
g.	☐	☐	☐	Is there more than one native oak of any size on the property or located within 200 feet of the protected zone of oaks on adjacent properties?
h.	☐	☐	☐	Is this woodland within the viewshed of a private road, public lands/trails, public roads, scenic highway? (County, State and Federal Trail maps will be used for basis of analysis)
i.	☐	☐	☐	Is the project site habitat for any known sensitive species (federal or state listed endangered, etc.)?
j.	☐	☐	☐	Other factors (e.g., wildlife corridor, adjacent open space linkage, oak woodland connectivity or potential)?

☐ **MITIGATION MEASURES** ☐ **OTHER CONSIDERATIONS**
☐ Lot Size ☐ Project Design ☐ Oak Woodlands Overlay ☐ Oak Tree Permit
☐ ERB/SEATAC Review (Biota Report required) ☐ Biological Constraints Analysis

CONCLUSION
Considering the above information, could the project have a significant impact (individually or cumulatively) on, **biotic** resources, including oak woodlands?

☐ **Potentially significant** ☐ Less than significant with project mitigation ☐ **Less than significant/No Impact**

SAMPLE QUESTIONS TO BE ADDRESSED IN THE EXPANDED ZONING PERMITS APPLICATION IF THE PROJECT IS DEEMED TO BE IN AN OAK WOODLAND OVERLAY OR BUFFER AREA :

1. List any known locally rare or uncommon species or associations found on the property. (Refer to CDFG Special Animal and Plant lists, Rare Habitat Associations, etc.)
2. What native understory species or associations are present? Describe.
3. Is natural leaf litter layer present? What is average depth?
4. What non-native species are present? List species, extent and impacts
5. What watershed is the project located within?
6. What is the site elevation, slope percent and aspect?
7. Describe surface soil characteristics. (sand, loam, clay, rock, etc.)
8. What is the designated NRCS erosion potential for the site? Are there any other NRCS listed site constraints (shrink-swell potential, percolation limitations, etc.)
9. Is this project located within a listed impaired water body?
10. Has the hydrologic regime or water source for the project site and surroundings been altered? Is so, describe.
11. Is the project site irrigated? Is so, describe.
12. Is this woodland within the viewshed of a private road, public lands/trails, public roads, scenic highway? (County, State and Federal Trail maps will be used for basis of analysis)

13. Describe any public use of the woodland (trails, birdwatching, etc.)

14. Describe any known historic or cultural significance of this oak woodland.

In addition, the following questions should be included in a Mitigated Negative Declaration (Oak Woodland Impacts) or Environmental Impact Report level of review.

1. Evaluate the existing carbon sequestration functions provided by the woodland in accordance with Air Resources Board forest conservation guidelines (ruling Oct 25, 2007)
2. The Forest Protocol established air quality criteria to be used to measure oak woodland biological emission for CEQA review: live biomass (including roots), standing dead tree biomass, and wood lying on the ground. Questions to be answered include: (1) how much potential CO2 sequestration over the next 100 years will be lost due to impacts to live native trees three (3) inches or greater dbh; (2) how much sequestered CO2 will be released if the live trees, standing dead trees or woody debris are burned?
3. How much temperature moderation is currently provided by the existing oak woodland?
4. How much stormwater runoff is currently being contained or absorbed on site?
5. How does this oak woodland contribute to air quality by reducing pollutants?
6. What level of management is needed to attain or maintain sustainability?
7. What is the influence of surrounding land uses such as zoning changes, LUP changes, specific plans, etc.
8. Describe the current level of oak woodland sustainability and ecosystem function.
9. Describe potential for degradation.
10. How will the proposed project impact any of the above factors?

APPENDIX 2

ECONOMIC VALUES ASSOCIATED WITH LAND DEVELOPMENT IN OAK WOODLANDS

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INTRODUCTION

In 2004 the California legislature approved Senate Bill 1334, amending the California Environmental Quality Act (CEQA) to specifically address impacts to California's oak woodlands. The law requires counties to determine if projects under their jurisdiction will have significant impacts to oaks and oak woodlands. SB1334 also provided a set of mitigation guidelines for these impacts, but gave project proponents the options of a mitigation fee in lieu of mitigations measures, to be paid to a state or local mitigation fund (Chapter 732, and Statutes of 2004) (PRC 21083.4) (Guisti 2006). Hence the success of SB1334 in Los Angeles County is dependent on a transparent method of calculating oak woodlands values, and the subsequent development of acceptable mitigation measures.

CEQA neither permits nor prohibits damage to the environment. It forces project proponents to disclose the potential impacts of a project on the environment and to consider meaningful alternatives and mitigation measures. Like many other aspects of CEQA, the estimation of significant impacts to oak woodlands under SB1334 was left to the discretion of individual counties. However, the primary power of CEQA lies in the ability of project antagonists to demand adequate methods of impact disclosure and to ultimately file lawsuits if methods prove to be inadequate.

SB 1334 allows counties to create local standards for oak woodland mitigation, but this flexibility forces the county to create mitigation/fee structures that are acceptable to all the parties involved in a CEQA process. If mitigation (by fee or action) becomes the price for oak woodland damage, then it seems reasonable to develop a way to insure that these mitigations are commensurate with any significant losses of oak woodland values.
Identifying significant damage to oak woodlands is a complex task, involving the delineation of woodlands, description of the ecosystem structures and processes altered by a project, and calculations of the significance of these alterations relative to natural fluctuations. Like the bundle of right landowner rights (discussed later), woodlands have components that are intangible or at least difficult to define in the CEQA process.

Furthermore, oak woodlands can be defined by a number of overlapping but not completely coincidental parts in natural landscapes (e.g., the distribution of two different oak tree species; insect species that migrate between oaks and different vegetation types, or the above- and below-ground oak biomass). Finally, oak woodlands cross all the boundaries (property, municipal, and county boundaries) that are used to define project areas in environmental reviews, and wildlife associated with oak woodlands move across these boundaries at even broader spatial scales.

In almost all situations, oak tree species are integrated into other vegetation types making oak woodland boundaries somewhat, to very, indistinct. Under these circumstances, solitary oak trees often become the units of conservation and management, and sparse oak woodlands are often demarcated at the drip lines of individual trees. The California Forest Practices Act uses a minimum of 10% cover of trees on the landscape (CPR 1978) to define a woodland. SB 1334 considered any stand of with more than 5 oak trees of >5 inch diameters as a woodland. These actions tend to protect oak trees as objects rather than component parts of woodland ecosystems. The characteristics of oaks and oak woodlands are further de-emphasized when mature oaks are mitigated with seedlings or saplings. Treating seedling and saplings as comparable units to mature oaks ignores the size, age, life history, survivorship, and wildlife habitat value of these large trees.

OAK WOODLAND OWNERSHIP

Since 1900, the population of the County has grown at a rate of 1 million residents a decade; with 10.4 million residents and a housing base of approximately 3.3 million units in 2008. About 60% of these

units are single-family detached homes. The County is still has about 56,000 parcels (>0.5 acres) in or near oak woodlands. As of 2009, there are over 150,000 existing homes in the immediate vicinity of oak woodlands in Los Angeles, and about 3.5 million residents live in census tracks with oak woodlands. Land and development potential have become commodities in Los Angeles County due to its scarcity. Waves of land development have divided many communities into homeowners who want to maintain their surroundings, and land developers, who wish to acquire yet more land to build houses. Each group has created a set of oak woodland values that they believe should take precedence over other values.

Land parcels are the primary units of oak woodland management, existing as legal descriptions of land boundaries filed with counties or cities (as representatives of the state). Catastrophic erosion or grading may change the landform of a property, but the parcel boundaries remain imperishable as lines connecting a set of geographic coordinates. In this sense, a parcel persists without regard to changes that occur to its physical attributes (structures, landscaping, vegetation cover, soils, geologic substrates or topography). Therefore, it is possible to calculate a value for land that completely ignores its woodland resources, or any other physical attributes.

Bundle of Rights in Land Ownership

Property ownership is traditionally described as a bundle of individual rights, which can be grouped into general categories of:

(1) right of possession – land ownership is protected by the title;
(2) rights of disposition - the title holder can sell, transfer or rent the land or its component parts;
(3) right of exclusion - others can be excluded from using the land;
(4) rights of control – title holders control the use of the land;
(5) rights of enjoyment - the owner can enjoy the products and use and of the land; and,
(6) right to remain free from harm (often considered a subset of the right of enjoyment).

These rights are sanctioned and protected by federal, state, and local governments, but this covenant can be modified by those entities in a number of situations, including:

(1) right to possess can be modified by eminent domain;
(2) rights of disposition can be restricted by anti-discrimination laws;
(3) right of exclusive use can be restricted by hunting-access laws, prescriptive rights, and involuntary easements;
(4) right to control use can be restricted by zoning, codes, conditions, or covenants;
(5) right of enjoyment (use) is not sovereign, and use of land is restricted by all laws that may apply to landowner activities; and
(6) right to be free from harm is imperfect, because unavoidable harm may have to be distributed inequitably across a group of landowners.

County options for oak woodland persistence are embedded among the rights associated with items 3 through 6. The crux of the issue involves the rights of enjoyment of use and freedom from harm.

Historic Property Laws and the Value of Plants and Animals and Oak Woodlands

In frontier landscapes, property laws emphasized owners' relationships with their land, and their right to improve it as they saw fit. U.S. courts have staunchly protected property rights, but at the same time have upheld state ownership (stewardship) of wildlife on private lands, and to a lesser extent the rights of non-owners to use that wildlife on unimproved lands (Lund 1980, Goble and Freyfogle 2002). State control of wildlife on private lands stems from British common law, where wildlife were protected by the king as a public trust. Even though plants are considered to be part of the land, British common law gave authority to the king to regulate activities involving both plants and animals, specifically to control damage to places where wildlife lived (Goble and Freyfogle 2002). The king also regulated some forms of plant use, with the prominent example of timber harvest.

The history of timber harvest regulations in the US dates from 1691 when the Massachusetts Charter restricted the cutting of all trees suitable for masts on British Naval ships (Dana and Fairfax 1980). California Forestry Laws have not treated oak trees (*Quercus agrifolia*, *Q. chrysolepis, Q. douglassii, Q. engelmannii, Q. kelloggii, Q. lobata, Q. tomentella, Q. palmeri*) as commercial-timber species under the state's forestry acts (1945, 1973), although these species were harvested for charcoal, firewood, palettes, stamp mills and other mining needs (Bahre 1991, Pavlic et al 1991). Wild plants, like oaks, were not given any kind of status, and by default were considered attached to property by the soil in which they grew (Merrill 2007). Products from wild plants were called ***Fructus naturales***, to separate them from cultivated plant products ***Fructus industriales***. Both were considered the property of the landowner.

After the American Revolution this control was passed onto states, and wildlife were not considered property of the owners of lands where they occurred. Oak woodlands tend to be used by a large number of species, including federally listed endangered species, like the Least Bell's Vireo (*Vireo belli pusillus*).

Finally, regulations over state-owned wildlife have a nexus with owner's use of plants and land on issues of habitat. Here again, government regulation of habitat (specifically habitat quality and destruction) stems from British common law, focused on restricting land uses that harmed wildlife. Habitat degradation on private lands was seldom an issue in the early colonization of the American West; but by the 1970s, habitat protection on private lands was enforced through a series of laws against habitat degradation, including Clean Water Act (CWA 1972), the Endangered Species Act (ESA 1973), and riders on other laws like the Federal Power Act (Beatzi and Wilderson 1990, Lund 1995).

Community Values and Private Lands

The demand for housing and the abstract nature of parcels can completely separate the value of land from the values of its oak woodlands or any other community values. In the built-out suburban environments of southern California, land laws have come to emphasize a tripartite relationship between the landowners, their neighbors, and the government. This is particularly true for highly developed regions, such as Los Angeles.

Singer (2000) suggests that the bundle of rights associated with land ownership has evolved into a more complex mixture of rights and responsibilities. The first cases of zoning and land regulation

were instituted to separate incompatible land uses; then nuisance laws were created to protect one landowner from another (Platt 2006). This interaction was expanded to protect entire communities from broader forms of nuisance (traffic congestion) and as cities grew, to protect community standards, in the form of codes, covenants, and restrictions (Platt 2006).

In contrast, landowners have developed the perspective that unfretted land-use is a norm and that regulations can be invoked only under exceptional situations (also see in Singer 2000). This vision of sovereign landownership has become conventional wisdom in southern California. However, land ownership is meaningless without the sanction of federal, state, and local governments.

Environmentalists have a different model, supporting local governments that allow a landowner to undertake only a limited set of permitted activities. The extent to which Los Angeles County chooses to protect oak woodland is a function of reconciling these two models' land-use controls. Local government restrictions on use of lands typically fall between these two perceptions of entitlements, based on community standards rather than comprehensive rules. State government, through Senate Bill 1334 (Kuehl 2004), has recognized oak woodlands (five or more trees of 5 inch diameter) as significant resources in the communities where they occur. Los Angeles County must therefore reconcile the requirements from a state level with local community values.

Discretionary permits, zoning, and planning documents like County General Plans all fall under the California Environmental Quality Act. Many of these County actions are based on protecting other landowners from harm, specifically the nuisance created by adjacent, incompatible land uses. Local governments attempt to keep landowners free from harm, but the creation of zoning also has established standing for non-owners in legal proceedings and discretionary decisions over land use (Scott et al 2007). The California Environmental Quality Act (CEQA, 1970) also gives non-owners standing in environmental reviews, and to be plaintiffs in lawsuits if these reviews inadequately disclose environmental impacts. CEQA doesn't prohibit land owners from any activity; it just requires them to fully disclose the impacts their actions may have on the environment and surrounding communities. SB 1334 instructed agencies involved in the CEQA process to specifically consider project impacts to oak woodlands as entities (Kuehl, 2002), although the standards for what constitutes a significant impact to oak woodlands are not necessarily clear (Guisti et al 2007).

Stakeholders in Oak Values

A wide variety of groups are involved in these calculations of oak values, with equally diverse motivations and needs. Land developers calculate the costs and benefits of building around oak woodlands. Homebuyers may see amenity value in oak woodlands or oak woodland view sheds, and therefore are willing to pay more for these amenities when they buy property (Diamond et al 1987, Standiford and Scott 2002). Real estate agents and appraisers incorporate these premiums into the price of woodland properties (http://danr.ucop.edu/ihrmp/oak89.htm). Homeowners may estimate and demand compensation if someone kills or damages oaks on their property (CTLA 2000).

For example, the City of Arcadia has assumed stewardship of oak trees within its boundaries, and requires an application for tree removal, including a method to mitigate the loss of oak woodland values. The County of Los Angeles, in a similar role of oak stewardship, requires that oak trees

removed under the current Oak Tree permitting system must be replaced. Both of these systems require permitees to plant seedlings to replace the oaks removed under permits. In this sense the City and the County have become stakeholders in oak value calculations, and the price of compensation is mitigation actions.

Finally, many environmental laws are written to grant standing to anyone seeking involvement in an environmental review or management of a resource. Because of SB 1334, anyone can become a stakeholder in the oak values of Los Angeles County, and demand that damage to their oak woodland values be calculated and mitigated under CEQA. The Endangered Species Act (ESA) gives anyone the right to challenge or sue to protect habitat for federally listed endangered species, which can include oak woodlands. Hence individuals and groups that are neither landowners nor regulatory agencies can become stakeholders when oak woodland values are calculated. This creates an exceptionally broad pool of individual potential stakeholders, including community, state, US, and international residents, and they seek an equally broad array of outcomes from existence values to firewood harvest.

TYPES OF OAK WOODLAND VALUES

The preamble of the Los Angeles County Oak Tree Protection Ordinance identifies several kinds of oak woodland values:

> "*As one of the most picturesque trees in Los Angeles County, oak trees supply beauty and charm to the natural and man-made landscape. Oak trees add distinct and unique aesthetic character to the areas of Los Angeles County in which they are indigenous. The oak tree permit is established to recognize oak trees as significant and valuable historical, aesthetic and ecological resources*."

A number of other values have been defined for natural ecosystems since the oak ordinance was written in 1982, including the amenity value of living next to a oak woodland preserve, or the value of ecosystem services like carbon sequestration, slope stability, and flood control.

ECOLOGICAL VALUES

Spatial Context

Ecologists include the spatial distribution of oaks when discussing the functional value of an oak woodland (IHRMP 2005). This value resembles the monopolistic value of land, in that the aggregate resources in an oak woodland at one location can never be replicated anywhere else.

From a pragmatic perspective, oak woodlands in Los Angeles County are as similar or dissimilar as we choose to view them. Nevertheless, the complex climate, geology, soils, and biogeography of the county tend to enhance the unique features of individual oak woodlands.

The value of these woodlands is linked to their scarcity; which in turn is affected by the rate and extent of oak woodland conversions. Location can become critical even when oak woodlands are still abundant: If a linear woodland is permanently severed, then the movement of wildlife along that woodland cannot be restored at a different location. In this sense, the spatial structure and context of an oak woodland are integral parts of its value.

Ecological Processes

Ecosystem processes represent a second component of oak woodlands that strongly influences their value. For example, oak trees survive summer drought because of hydrologic processes that move water through the soils and substrates where oaks occur; and symbiotic processes allow oaks to move water into their roots. Environmental reviews may fail to consider the source of water for woodlands. However, if the pathway of this process is disrupted, then woodlands are unlikely to remain intact. It is important to note that processes like the hydrologic cycle extend far beyond the canopy of oak trees. The relationship between the woodland and its watershed must be considered in defining an oak woodland and hence are important in estimating oak woodland values.

The life history of oaks provides another example of woodland processes that are difficult to detect in standing trees. Stands of oaks appear remarkably stable; however, individual oak trees eventually succumb to diseases, insect pests, and competition for water, nutrients and light. The process of tree replacement is not necessarily visible in the patterns of trees across a landscape. Coast live oaks have a remarkable ability to expand woodland boundaries when conditions are good, and to survive in an area when conditions degrade. Oaks can rapidly produce thousands of acorns and seedlings, and an established seedling can become trees in a relative short time (5 years). The process however, is dependent on suitable conditions for seedlings to germinate and thrive. The values associated with the individual oak trees can be intact, but the values associated with the ability of the oak woodland to thrive over time have been altered.

CURRENT METHODS OF ESTIMATING OAK WOODLAND VALUES

Types of Estimates

Oak woodland values are never absolute; they are governed by the situation wherein they occur and the motivations of the persons involved. In the past, these values have been calculated to: (A) estimate compensation for damage; (B) appraise land value in real estate transactions; or (C) estimate non-market values and cost/benefit of management options.

In the first case, oak woodlands are assigned a dollar value to calculate the cost of settlements in tort cases, CEQA mitigation, or *post facto* penalties/fines when oak trees or woodlands are damaged. In the second case, oak woodlands have a market value in real estate transactions, either as an amenity, because they enhance the land-owner's quality of life; or as a resource attached to the land (firewood, edible mushrooms). In the third case, values present in oak woodlands become independent of the land where they occur, and are used to estimate the relative costs and benefits of management actions or relative value of ecosystem services (wildlife habitat, carbon sequestration, watershed protection).

II. A. Replacement Values

One of the most direct means of establishing the value of oak woodlands is to calculate the cost of recreating these values after they are lost. Pincetl (2009) suggests that only by examining the costs of restoring impaired or damaged oak woodland, can we determine how much functional oak woodland is worth. In theory, replacement or restoration costs bypass the need for estimation of abstract or non-market values, by assuming that all these values are restored once the mitigation is carried out. Organizations can forego the complicated process of identifying stakeholders and calculating the

values for each instance where an oak tree or oak woodland is damaged. The disadvantage is that the replacement value becomes a general solution to the specific values that are lost when an oak woodland is damaged. There are four models of replacement value: (1) acquisition of oak woodlands that are equivalent to the oak woodlands converted to other land-uses; (2) complete restoration (or creation) of oak woodlands; (3) partial restoration of oak woodland values, (4) planting of oak saplings to replace oak trees removed from the landscape, and (5) transplanting oak trees that would be lost in a project.

Acquisition of Oak Woodlands

The value of oak woodlands is linked directly to the land price (and subsequent management costs) and endowments to manage replacement woodlands. The structure of woodland acquisitions and the mitigation fee are not fixed; however the WCB set guidelines to insure consistency in mitigation across counties. In turn these guidelines can be translated into the price of mitigation and hence the value of oak woodlands.

The foremost guideline is that mitigation payments will be used to acquire oak woodlands that are at minimum equivalent to the oak woodlands lost (same species, physical characteristics and site conditions). Ideally the woodlands that are appropriate for mitigation would be identified *a priori*, through an inventory conducted by the County.

Second, the amount of compensation should be calculated as the assessed value of the land that contains the replacement oak woodland or the assessed value of an easement over the replacement woodland. If no replacement woodland can be found, then the value would be based on either the appraised value of the land where the impact to oaks occurs, or the median assessed value of comparable oak woodlands in the vicinity.

Third, the acreage of replacement woodlands have at least a >2:1 ratio to the acreage of the impacted oak woodlands.

Fourth, the total area of oak woodland acquired should match area (footprint) of all significant impact to the oak woodlands - both direct loss (housing pads, driveways) and indirect loss (changes in hydrology, pastures, recreational trails and other activities).

Finally, mitigation depends on the persistence of the replacement woodlands. Because there is risk in perpetuity, woodland persistence needs to be underwritten with an endowment, calculated by a standard method (CNLM 2004). This guideline translates into 10 to 25% of the land value, depending on the size and circumstances of the replacement woodland.

Restoration of oak woodlands

Oak woodland value can also be calculated by the cost of restoring woodland ecosystem structures and processes. This occurs in two forms: first, on-site restoration has been undertaken to reclaim lands after mining or temporary construction (i.e., underground pipelines); second, off-site restoration has been undertaken to mitigate the permanent conversion of oak woodlands into other land-uses.

In either case the value of an oak woodland is set by the cost of re-establishing woodland ecosystem structure and functions. Uncalculated in this cost are loss of woodland ecosystem functions for the time period between initial loss and recovery. Furthermore, there is a risk that the price of restoration, negotiated at the time of loss, may not necessarily cover the cost of woodland restoration or may not achieve a complete restoration of the values lost. The state requires a bond to insure that the restoration is still underway 5 years after it is initiated.

Restoration of specific oak woodland values.

There are situations where restoration efforts are focused on part but not all of the oak woodland values. This situation arises when an oak woodland has an identified problem, such as exotic grasses in the understory, altered hydrology or soil surfaces, or a lack of seedlings/sapling recruitment. It is less frequently employed to enhance the value of a woodland for a single species. This provides a way to calculate the replacement value of a woodland component; but it also may create new costs if the oak woodland ecosystem is further disrupted. Finally, partial restoration efforts can occur because only a subset of the woodland values is impacted by a project.

Replacement of Individual Trees

In 1982 the County of Los Angeles adopted an oak tree ordinance that required a County permit to cut or remove any oak tree larger than 2 inches in diameter (Chapter 22.56.2050: Regulations, Los Angeles County, Adopted: August 20, 1982. Amended: September 13,1988). Permits to remove oaks require that each oak be replaced by minimum ratio of 2 saplings or seedlings. The unresolved issue with this replacement method is that mitigation seedlings do not replace the values associated with mature trees: size, shape, and other aesthetics; wildlife habitat, acorn mast, shade.

More important, replacement seedlings have some probability of failure as a mitigation, but this risk of failure is not built into the calculation of mitigation price (2 planted seedlings). Finally, it takes up to a 100 years to replace a 100-year-old tree. This creates a long-term gap in resource availability, which translates into a cost (loss of use) that is not calculated in the price paid for mitigation.

Transplantation

Oaks transplanted during a project maintain a fraction of their original values at the transplant site. The County does not count transplanted trees as part of the mitigation plan, but rather as a risk taken by the property owner. The value of these oaks is reduced because:

(1) transplanted oaks will not have the same functions at the new location,
(2) transplanted oaks have reduced root areas and often have reduced canopy areas,
(3) transplanted trees do not have the same level of vigor,
(4) the absence of oaks at the transplant site may indicate that oak do not belong there and may require permanent maintenance, and
(5) cost of the loss of another habitat when the oak trees are transplanted.

Nevertheless the high number of transplanted oak trees in Los Angeles suggests that individual trees are considered worth the cost of transplantation (>$25,000 for small trees; over 1 million dollars for specimen trees).

B. Appraised Land Values

Land Transactions

The most fundamental means of transferring property is a ***Fee simple*** transaction, where the rights attached to ownership of a parcel are passed from one owner to another. Land owners also can divide and independently transfer individual rights during these transactions (Platt 2007), creating a complex array of relationships between owners and their use of land. The flexible nature of land transactions and the separable nature of land rights contradict the conventional wisdom that land ownership carries a fundamental set of land use rights. The obvious example in Los Angeles County is homeowner relationship to the mineable minerals or water within their parcels, which vary by prior use, jurisdiction, and location in a watershed.

Real estate markets have created a demand for flexibility, leading to a variety of ways to own and transfer rights beyond ***Fee simple*** transactions such as ***Leaseholds*** where a subsets of rights are rented or ***Easements*** which provide rights in specific locations on a parcel. Different types of ***trusts*** and ***contracts*** transfer different arrays of ownership rights by complex schedules and conditions among complex collections of interested parties. Options for oak woodland protection acquisition include: (1) fee simple acquisition of parcels with oak woodlands; (2) purchase or dedication of conservation easement to restrict use of oak woodlands; (3) deed restriction on type and footprint of land development; (4) subdivision of property with oaks into parcels that can be developed and parcels with oak woodlands, with are not allowed to be developed.

Fees in lieu of Acquisition

SB 1334 allows developers to pay into a mitigation fund as part or all of mitigation measures for impacts to oak woodlands (CPRC 2004). Payment can be made to either the state Wildlife Conservation Board (WCB), in the California Department of Fish and Game, or to the agency administering oak conservation in the county where a CEQA review occurs. In theory these fees represent the cost of acquiring an oak woodland equivalent to the woodland lost, allowing some flexibility in where mitigation occurs. This may or may not result in adequate compensation for loss of the oak woodlands in a specific location where there are few opportunities to protect comparable acres of oak woodland. Mitigation funds can also be used for management and education, and in theory fees represent some combination of acquisition and management costs of replacement woodlands.

Fees related to the Intrinsic value of individual trees

The Council of Tree & Landscape Appraisers "*Guide for Plant Appraisal*" (CTLA) is currently the most common method used to assess individual tree value. With a long history of use in calculating the value of tree damage in tort cases, the CTLA provides an accepted tool for calculating the worth of a tree based on its species, condition, and location. These factors are evaluated either using a

Replacement Cure method, which is applied to smaller trees that could realistically be purchased at a nursery, or the Trunk Formula Method, which is used to estimate the value of trees considered too large to be readily available. Each factor can be depreciated by the appraiser if the species is not locally native, in poor condition, or located where it does not contribute substantially to the overall woodland landscape.

The advantage of the CTLA system is that the damaged party is paid at the time of damage, and is not left with a promissory mitigation, which may or may not materialize. A recurring disadvantage with this method is that it is possible to generate a value for the trees that is greater than the real estate value of the land the trees occupy. Another problem is that this method fails to incorporate any ecosystem service values, and instead focuses primarily on the anthropogenic values.

III. B. Amenity values in Real Estate

Properties with functional oak woodlands offer higher real estate benefits (amenity values) than comparable lands without oaks (Standiford et al 1988, Standiford 1999, Standiford and Scott 2002). Appraisers separate the value of trees on a property, often by comparing the sales prices of property with and without oaks woodlands. This valuation only captures the buyers willingness to pay for oak woodlands, and does not reflect the ecosystem service function values.

C. Estimating Non-market Values

Economists examine environmental values from several different perspectives. A few believe that environmental amenities can and should be valued in exactly the same way as any other good (Baerenklau 2009). However, others such as Salzman (2005) suggests that it is the role of government to pay for achieving ecosystem service protection, because these services cannot be bought or sold and thus function outside of the traditional market system. Others feel that markets reflect individual, rather than community property values in the context of human use only, are volatile and reflect current ideas of value, but don't reflect enduring or intrinsic values.

Typically, the benefits provided by functional oak woodlands have not been incorporated into the cost-benefit equation because they are difficult to assess. These benefits are described as *non-market values*, and include those elements of oak woodlands that have no commodity, consumptive or dollar equivalency. Examples would be passive uses such as recreation, open space, and watershed protection.

Contingency Values

Non-Use values are those that do not derive from in-situ consumption of the resources (Kopp and Smith, 1993). Recreational opportunities provided by oak woodlands (hiking, bird watching, etc.) result in dollar benefits to local businesses, increase real estate value of adjoining properties, and are considered valuable by both local and long distance stakeholders. Travel costs to access an oak woodland open space, and willingness-to-pay for protecting oak woodlands are examples of methods used to identify how important these resources are in a contingency valuation setting.

Ecosystem Services.

Oak woodlands are critical components of healthy terrestrial and aquatic ecosystems, providing habitat, preventing erosion, moderating water quantity and supporting water infiltration, sequestering carbon, filtering out air and water pollutants, moderating temperatures, and supporting watershed function.

The California Air Resources Board (2008) and the California Forest Protocol (SB 812 2002) has designated the conversion of oak woodlands to non-forest use as a biological emission of carbon dioxide that is subject to CEQA analysis and mitigation. The air quality criteria established requires the measurement of oak woodland biological emission by documenting the live tree biomass (including roots), standing dead tree biomass, and wood lying on the ground. With this information in hand, then the protocol requires that the potential carbon sequestration over the next 100 years be calculated for all trees over three inches or greater diameter at breast height (dbh), as well as determining how much sequestered carbon would be released if the live trees, standing dead trees and woody debris were burned. Comparison of the existing condition to the proposed condition following the land use change would then be used to identify the level of significance for this impact.

Additionally, there are several methodologies that are used to document the amount of water run-off reduction, air pollution filtration, temperature moderation (energy use) and erosion control benefits provided by a tree or group of trees. Most are designed for use primarily within the urban forest context, rather than natural landscapes, however, given the proximity of most oak woodlands in Los Angeles County to the urban edge, these may be applicable.

Existing models that may have applicability for oak woodland service estimation include:
- Urban Forest Effects (UFORE) is a computer model designed to characterize forest structure (species composition, number of trees, size, density, health, leaf area, biomass, diversity) and use these variables to evaluate primarily air quality parameters like removal of particulate matter, carbon sequestration and storage, temperature effects resulting in energy use benefits and pollen impacts (Nowak and Crane 2000).

- STRATUM is the street tree management and analysis tool used by many local cities. Using commonly collected inventory data on tree species, size, health and location, the computer model calculates the dollar value of aesthetics, energy conservation, air quality improvement, carbon dioxide reduction, stormwater control and property value increa The applicability of this model to oak woodland land use conversion is dependent on the location of the proposed development in relation to a more urbanized environment (USFS 2009).

-InVEST is another computer program designed to “help land managers and
government workers assess this wide array of services” (ESA Press Release). InVEST stands for Integrated Valuation for Ecosystem Services and Trade-offs.2

FUNDAMENTAL MODEL FOR OAK WOODLAND VALUATION

All of these different means of calculating oak woodlands values can be combined in the following manner:

Total Oak Woodland Value =

Market Values (includes underlying land value) + Non-Use Values + Ecosystem Function Value

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APPENDIX 3

FACTORS AFFECTING OAK WOODLANDS IN LOS ANGELES COUNTY

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Factors Affecting Oak Woodlands in Los Angeles County

Oak woodlands are the most biologically diverse broad habitat in the state and very important to basic functions that are in the public commons. Removal of oak woodland is a substantial impact to the biological diversity of the area and Los Angeles County. These trees, especially jurisdictional trees, provide numerous values to the commons: they supply aesthetics, recreational opportunities, control soil erosion, provide management of the water table with slow release to the atmosphere and soil, provide carbon sequestration, and produce oxygen. They filter water; filter air; amend the soil. Woodland loss in general throughout the world results in more greenhouse gas production than all burning of fossil fuels for transportation. California has about 8 million acres of oak woodlands, and about 1 million of these are considered jeopardized by development and other clearing. In terms of biological function they provide habitat for over 300 vertebrate species, thousands of insects, and a myriad of associated plants. They moderate temperature extremes for all these as well as humans.

When oak woodland is removed, it is not simply trees that are missing but all these functions and habitat. Woodlands are a repository for biodiversity, due to the number of affected species. Along with other individuals in their population, they are a repository of genetic variability that can sustain the species in times of environmental change. Removal of woodland habitat needs to be fully mitigated to 100% replacement in order to claim "reduction of impacts to a less than significant impact." The replacement of the entire habitat must be undertaken, but return of the oak woodland is chiefly out of the tree mitigator's hands, and is a matter of probability. Oaks grow slowly. It will be a long time or perhaps never when the lost community of oak woodland is replaced by plantings. When a project replaces the woodland loss, it also mitigates for losses of the species that live or use the habitat.

Habitat for Plant and Wildlife Species

Oak woodlands provide critical wildlife corridors and linkages, promoting dispersal from one area to another for numerous species, from fungi to mule deer. The shape and size of oak woodland habitats dictates the function, with larger, contiguous woodlands functioning most effectively. Some species are more sensitive than others to edge effects, and rely on the larger oak woodlands to provide a buffer to intrusions. The notion of a corridor is somewhat misleading, in that very few species utilize long narrow corridors of habitat. When oak woodlands are embedded within other urban and agricultural land uses, their integrity declines and the barriers of houses and roads, clearing and night lighting alter wildlife movement, disrupting dispersal between stands.

A variety of studies show that species diversity and composition change between larger and smaller woodlands, and change in relation to the distance from development. (Scott 1996). The composition of the understory plays an important role in woodland value, with native undisturbed areas more diverse than those dominated by non-natives (Hilty et al. 2006)

Landscape Function (parcel level, watershed level, regional level)

Removal of oak woodlands has ripple effects starting at the single tree and extending throughout the watershed. Because oaks are wind pollinated, trees isolated further than 200 meters apart have difficulty producing acorns (Sork 2008). Individual trees often survive, but their contribution to the long-term stability of the oak woodland is compromised. The ripple effects of oak woodland loss within a watershed and on a landscape level are both direct and indirect.

When oaks and their associated community are removed, there can be immediate changes in soil stability and water quality. A study done in the Sierra Nevada foothills found that following the removal of blue oaks, the sedimentation levels in nearby streams increased. Nutrient concentrations in the streams also increased, while they decreased in the soils (Camping et al. 2002). The ecosystem service functions provided by the woodland are reduced, and removal necessitates costly built infrastructure such as storm drainage systems to replace the woodlands moderation of storms and percolation through the oaks that restores groundwater processes take their place. Several cities have found that the cost of protecting the floodplain and maintaining an intact riparian corridor was far less expensive than building a stormwater system capable of doing the same job (Seattle Public Utilities 2009).

On the landscape level, these ecosystem service values add up significantly. Whether it be the aesthetic and visual benefits of driving along a road through oak studded hillsides, hiking a trail through the woodland or the cumulative benefits of air pollution reduction, water quality improvements, or water storage benefits, the contributions of oak woodlands to the health and well-being of the residents of Los Angeles is enormous.

Oak Population Biology

Throughout California, the lack of oak regeneration in various native oak species has raised serious concern for landowners, policy makers and the public. Several statewide surveys have shown that some native oak species, including blue and valley oak, have inadequate levels of regeneration to sustain their populations over the long term. Oak woodlands need to produce enough new trees to offset the loss of mature trees due to natural mortality factors. This process relies on the successful establishment and growth of new seedlings and eventual recruitment of these seedlings to the sapling and tree stages. Without adequate regeneration, oak stands thin out over time and eventually disappear as the last specimens die.

Low acorn production

Acorn production varies widely from year to year, and from species to species. Also, acorns of many of the oak species found in Los Angeles County germinate in the winter after they have dropped and do not persist as a seed bank in the soil from year to year. Most oaks regenerate from a bank of persistent seedlings beneath the canopy, or a “seedling bank.” Since most acorns land under or near the

canopy of the parent tree, most of the seedling bank is in this area. The shading and buildup of organic mulch beneath oak canopies favor acorn germination and early seedling growth.

Poor Seedbed Conditions

Although oak canopy enhances seedling establishment, it suppresses the transition of seedlings to saplings. Persistent oak seedlings, which may be no taller than six inches in species such as blue oak, may survive for years in the understory (Bernhardt and Swiecki 2001). These seedlings can produce a strong root system but show little shoot growth. In fact, shoots of persistent seedlings may periodically die back to the ground, and resprout from the seedling base in the following growing season.

Understory seedlings typically remain suppressed until competition is removed or eliminated by the decline, death, or removal of overstory trees. Seedlings released from overstory suppression can respond with relatively rapid shoot growth and can grow into saplings that eventually refill the canopy gap. Although a lack of sapling-sized oaks has been used to suggest that oak regeneration is inadequate, oak saplings are not likely to be found in well-stocked woodlands. A lack of saplings in and near recent canopy gaps, however, is clear evidence of inadequate regeneration. In woodlands with stable canopy cover, low populations of persistent seedlings in the understory are the primary indicators of inadequate regeneration.

Although most oak regeneration occurs through this pattern, some acorns are planted beyond the oak canopy by seed-eating animals, especially scrub jays and acorn woodpeckers. If these acorns are placed in a favorable seedbed in areas that have good levels of soil moisture, minimal amounts of plant competition, and little or no impact from herbivores, the acorns can produce vigorous seedlings. Pioneer colonization of this type is seen in gardens, landscape beds, and sometimes along roadsides beyond pasture fences where browsing is minimal and road runoff provides additional soil moisture. Artificial methods for establishing oaks from seed are based on creating such favorable conditions through weed control and protective enclosures. These conditions are uncommon in open grasslands used for livestock range, however, so oaks do not typically colonize these areas even if they have historically supported oak woodlands.

Various factors can contribute to poor seedling establishment, short seedling persistence, and lack of recruitment from the seedling to the sapling stage. Some or all of the following factors may constrain regeneration at a given site— alleviating only one constraint may not be adequate to ensure regeneration.

Pollination

Most California oaks that have been studied appear to require cross pollination to produce adequate acorn crops. Because oak pollen is dispersed by wind, adequate pollination will not occur in oaks that are far from others of the same species. Hence, isolated trees may produce few if any acorns.

Leaf litter

Healthy mature acorns normally fall from trees between September and October, often well before the soil has been wetted by fall rains. Natural mulch composed of leaf litter provides protection for acorns. Mulch prevents acorns from being overheated and desiccated and also protects at least some from being eaten. In areas that lack natural mulch and have been compacted by livestock, few acorns may be able to survive and germinate.

Herbivory

Animals that eat acorns and seedlings can substantially impact the growth and survival of oak seedlings and saplings. Rodents, deer, and livestock all have the potential to limit or eliminate oak reproduction, but the relative importance of each herbivore varies by location. Gophers, ground squirrels, and voles can kill juvenile oaks by chewing and girdling stems. Livestock eat and trample understory seedlings, depleting or eliminating understory advance regeneration. Heavy browsing of seedlings by livestock or deer can indefinitely suppress their growth and inhibit recruitment to sapling and tree size classes. Interior live oak is less palatable to livestock than valley and blue oak, so grazing impacts species differently.

Sudden Oak Death

Phytophthora ramorum is the cause of both Sudden Oak Death, a forest disease that has resulted in widespread dieback of several tree species in California and Oregon forests, and Ramorum blight, which affects the leaves and twigs of numerous other plants in forests and nurseries.

Since the mid 1990s, *P. ramorum* has caused substantial mortality in tanoak trees and several oak tree species (coast live oak, California black oak, Shreve oak, and canyon live oak), as well as twig and foliar diseases in numerous other plant species, including California bay laurel, Douglas-fir, and coast redwood. The pathogen was also discovered in European nurseries in the mid 1990s, and it has since spread to wildland trees in the U.K. and the Netherlands. Although the first *P. ramorum*-infested California nursery stock was identified in 2001 (Santa Cruz County), the U.S. nursery industry was not widely impacted by the disease until 2003, when the pathogen was detected in California, Oregon, Washington, and British Columbia nurseries.

P. ramorum thrives in cool, wet climates. In California, coastal evergreen forests and tanoak/redwood forests within the fog belt are the primary habitat. Research in California forests has shown that the greatest predictor of *P. ramorum* is the presence of California bay laurel (*Umbellularia californica*). Nurseries outside of these cool, moist areas often create microclimates which mimic the preferred environment of *P. ramorum* and allow it to grow and spread far from the coast.

Sudden Oak Death has not been identified in the wild in Los Angeles County to date.

Pests and Diseases

Native oaks in California are host to, and may be affected by, a wide range of insects, mites and diseases. There are probably about fifty such agents, which may either cause serious damage or produce conspicuous impacts. Some of these may be difficult to detect and can cause significant structural and/or health impacts. Others may be highly visible but do little harm to the oaks. Some of the most damaging and/or visible are listed below (those that can be serious problems to oak survival are marked by an asterisk).

Recent introduction of the gold-spotted oak borer (*Agrilus coxalis*) in San Diego County is of particular concern. Trees infested with this borer die.

Common Diseases:

Oak anthracnose, twig blight, leaf spots (various fungi species)

Powdery mildews (various fungi species)

Branch canker (*Diplodia quercina*), orange hobnail canker (*Cryphonectria gyrosa*)

Oak mistletoe (*Phoradendron villosum*)

* Canker rots (*Inonotus andersonii, I. dryophilus*)

Hypoxylon thouarsianum

*Sulfur fungus (*Laetiporus sulphureus*)

Wetwood, alcoholic flux (various microorganisms)

*Oak root fungus (*Armillaria mellea*)

*Ganoderma root rot (*Ganoderma applanatum, G. brownii, G. lucidum*)

*Phytophthora root rot (*Phytophthora cinnamomi* and others)

Common Insects

Filbert weevils (*Curculio* sp.), filbertworm (*Cydia latiferreana*)

California oakworm (*Phryganidia californica*)

Gall wasps (various species)

Goldspotted Oak Borer (*Agrilus coxalis*)

Kuwana oak scale (*Kuwania quercus*)

Oak lecanium scale (*Parthenolecaium quecifex*), pit scales (*Asterolecanium* sp.)

Whiteflies (various species)

Twig borers (various species), oak twig girdler (*Agrilis angelicus*)

Ambrosia beetles (*Monarthrum* sp.), bark beetles (various species)

Borers (various species), Sycamore borer (*Synanthedon resplendens*)

Water stress

Due to California's Mediterranean climate, water stress associated with summer drought is an important factor limiting oak seedling survival and growth. Water stress is increased by the presence of non-native annual grasses and forbs in the understory that deplete soil moisture rapidly in the late spring. Shading provided by the oak canopy reduces impacts from temperature and wind speed, thereby reducing water stress. However, overstory oaks ultimately compete with seedlings for soil moisture, suppressing their growth. In riparian areas where soil moisture is less limited, valley oak regeneration can advance to the sapling size class even in the presence of overstory canopy.

Fire

Most of the tree oak species in California are adapted to tolerate fire in varying degrees, but none have been shown to require fire for regeneration. In contrast, studies have shown that even though oak seedlings and saplings resprout readily after topkill, many juvenile oaks are killed by fire. After topkill, resprouting oak saplings require several to many years to recover their aboveground biomass. Repeated destruction of oak shoots in successive years depletes seedling energy reserves and increases the likelihood of mortality. The combination of repeated fire and grazing is especially damaging to oak regeneration, and has historically resulted in conversion of woodlands to grasslands.

At a given site, one or more of the factors listed above may be constraining seedling establishment and growth. Restoring regeneration potential may require changes in management practices to alleviate those factors that completely inhibit oak seedling establishment and sapling recruitment. Management changes can have both positive and negative consequences, however. In some areas, complete cessation of grazing can lead to greater competition from non-native grasses and increased vole populations, leading to more seedling damage and reduced oak seedling establishment. Site-specific assessments are generally needed to assess the status of oak regeneration, identify factors that may be limiting regeneration, and develop management strategies that can promote natural regeneration. These same principles apply in areas where attempts are being made to restore oak woodlands.

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APPENDIX 4

OAK SPECIES OF LOS ANGELES COUNTY

Draft Prepared by:

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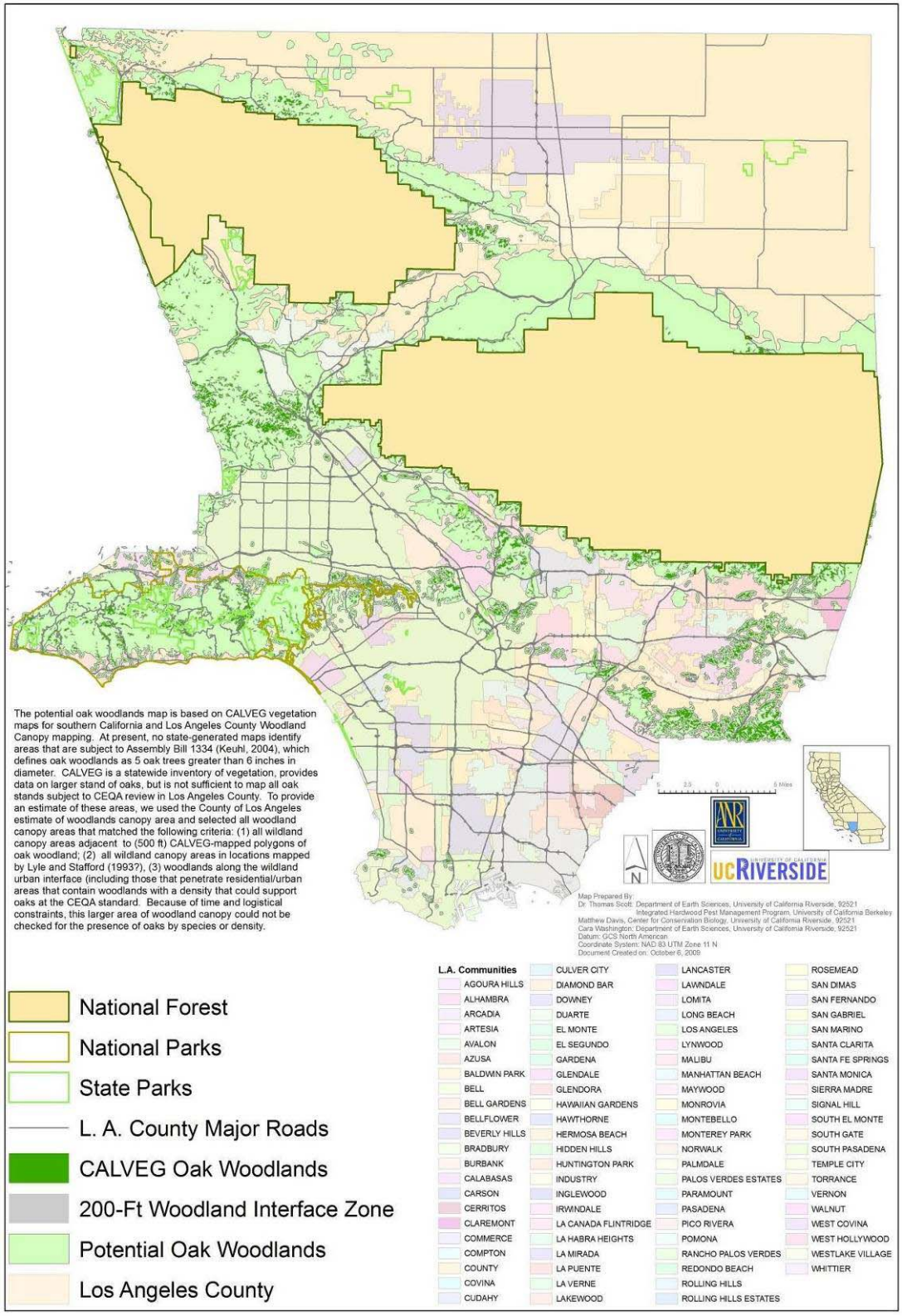
INTRODUCTION

Los Angeles County encompasses 470 square miles with a complex topography ranging from sea level to 5,080 feet. The County contains islands, coastal plains, inland basins, foothills, precipitous mountains, and desert.

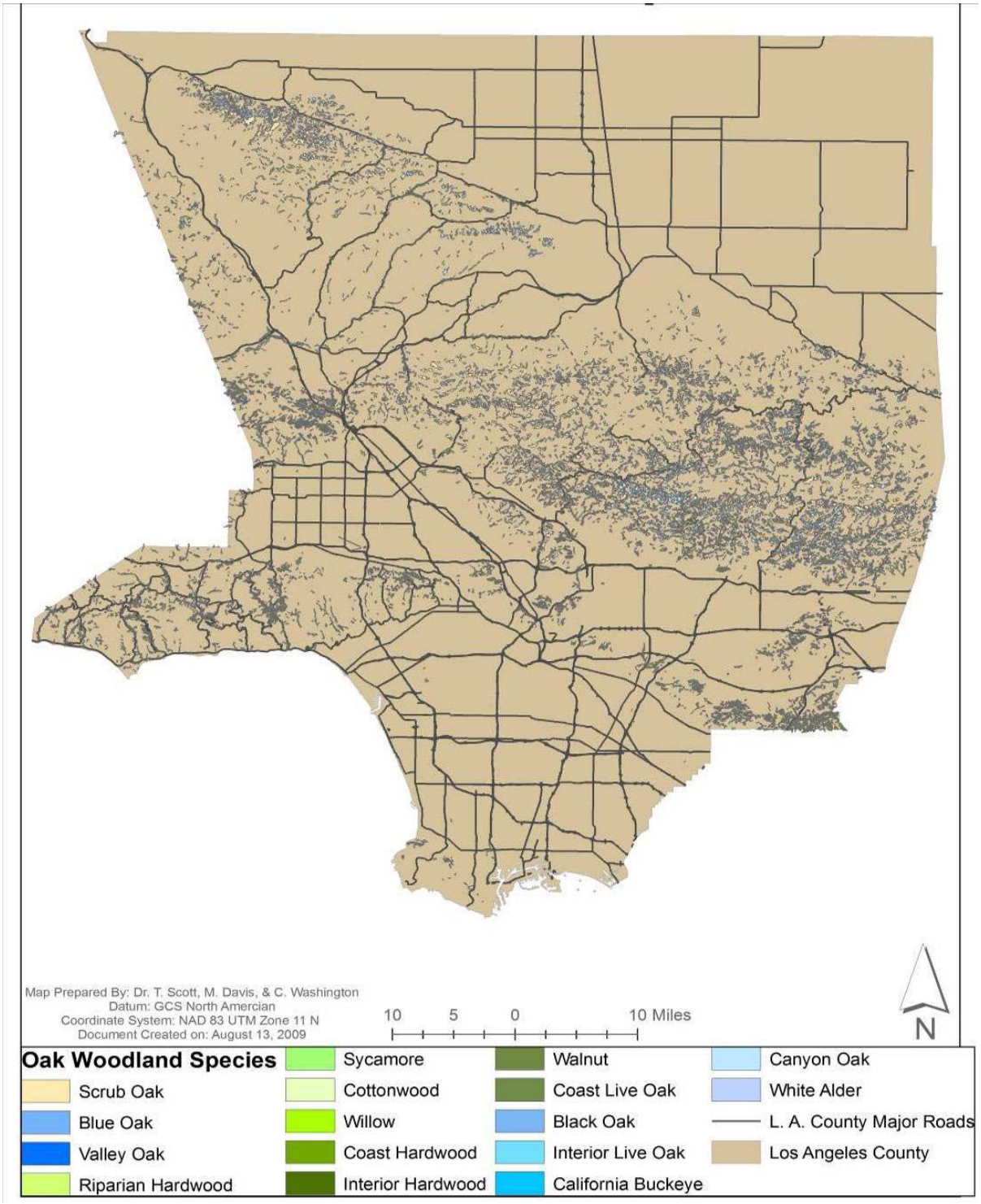
The Jepson Manual of Higher Plants of California (Hickman 1993) recognizes five major physiographic-biologic subdivisions in Los Angeles County. There are two provinces, the Southwestern Region of the California Floristic Province and in the north-east, the Mojave Region of the Desert Province. The Southwestern Region is represented by three subregions having distinct topographic, climatic and plant-community characteristics: South Coast (Coastal Basins and Valleys), Peninsula Ranges (Chino and Puente Hills), and the Transverse Ranges. The Transverse Ranges subregion is divided into two districts representing localized physiographic and biotic variations: the San Gabriel Mountains and the Western Transverse Ranges, the latter including the Santa Monica, Santa Susana and Liebre Mountains.

The result of this physical and environmental diversity is high biologic diversity. Fourteen of the 22 native oak species listed in the Jepson Manual occur in Los Angeles County. In addition, a new species has been recently recognized in the County (Roberts 1995) and two hybrids occur not recognized in Jepson (Boyd 1999). Oak communities are similarly diverse, with at least 13 alliances (regional community types) and numerous associations (local community types). The follow account provides a summary of the Los Angeles County oaks species and communities identified in various publications and reports.

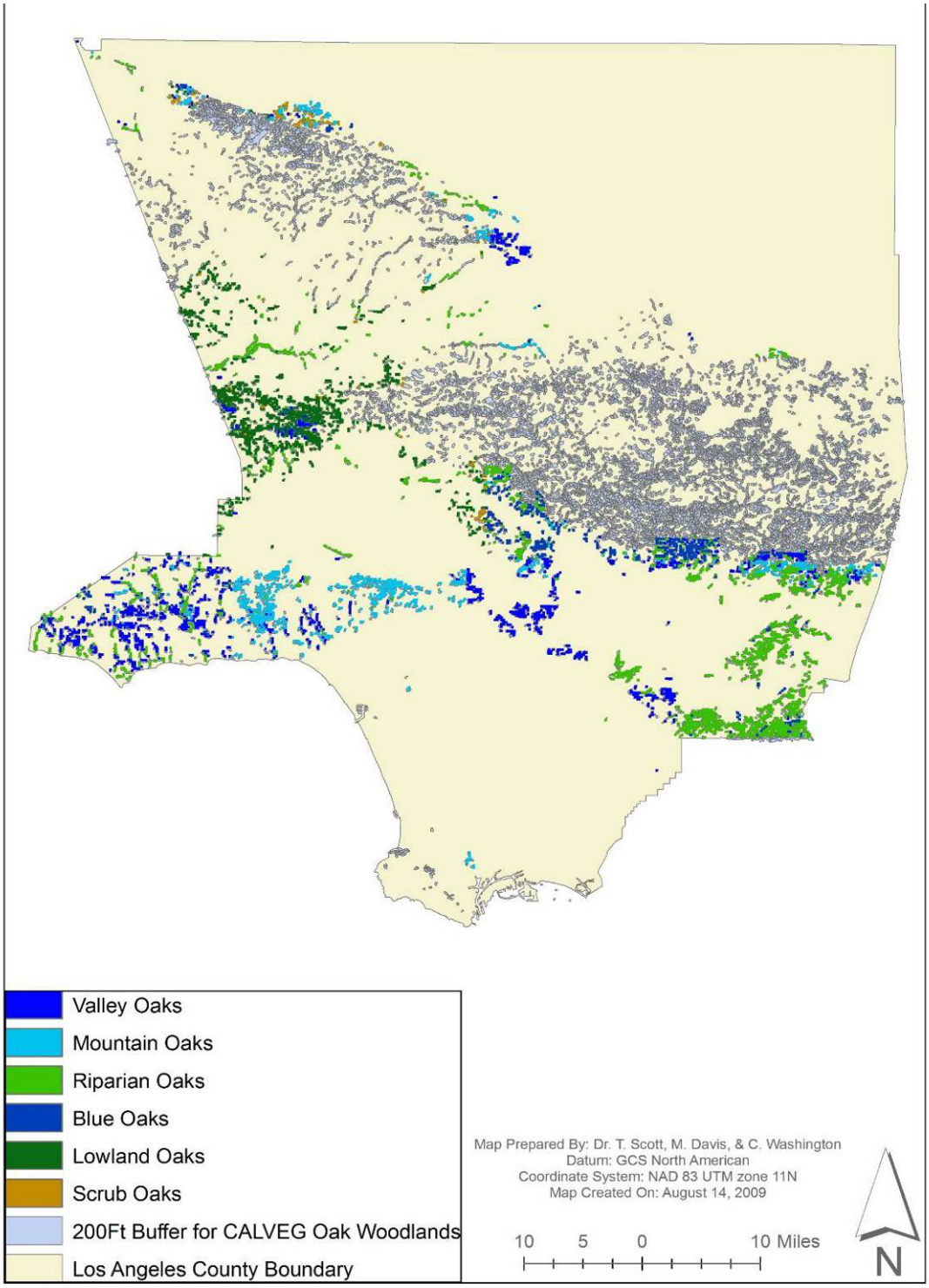


Los Angeles County Oak Woodland Species

The oak woodland species distribution map that follows was developed based on CALVEG data.



Los Angeles County Oak Woodland Species Distribution Map



Canopy cover of Oak Woodland Species in Los Angeles County

OAK SPECIES OCCURRING IN LOS ANGELES COUNTY

The following summary is primarily drawn from the Oaks of the Southern Californian Floristic Province by Fred M. Roberts, Jr. (1995).

Listed locations are the Liebre Mountains located on the west end of the San Gabriel Mountains (**L**), Santa Monica Mountains and Simi Hills (**SM**), Santa Susana Mountains (**SS**), San Gabriel Mountains and foothills (**SG**), the Verdugo Mountains (**V**) and the Chino and Puente Hills (**C-P**).

TREE OAKS

Coast live oak (*Quercus agrifolia*)
Below 3,000 feet. L, SM, SS, SG (southern slopes), V, C-P, Santa Catalina Island. Evergreen. Canyons, valleys, foothills, moist slopes and along streams. The most common tree oak in Los Angeles County. Frequently occurs in sycamore woodland and chaparral.

Valley oak (*Quercus lobata*)
Below 2,000 feet. L, SM, SS, San Fernando Valley (minor).
Deciduous. Valleys, rolling hills and along streams in the west County. Often occurs as open savanna.

Blue oak (*Quercus douglasii*)
Below 3,500 feet. L, Santa Catalina Island.
Deciduous. Valleys, foothills. Restricted to the northwest County.

Engelmann's Oak (*Quercus engelmannii*)
Below 4,000 feet. SG (foothills Pasadena to Sierra Madre).
Semi-deciduous. Foothills and alluvial fans of the southern San Gabriel Mountains.

Canyon live oak (*Quercus chrysolepis*)
Above 1,700 feet. L, SG.
Evergreen. Shrub at higher elevations. Mountain canyons and slopes. Often a component of conifer forests and sometimes higher-elevation chaparral.

Black Oak (*Quercus kellogii*)
Above 4,000 feet. L, SG (eastern).
Deciduous. Montane species. Occurs in conifer forest. Restricted to the northwest and far east of the County.

***Quercus x morehus.* Hybrid of black oak and interior live oak.**
Above 4,000 feet. L.
Evergreen. Sometimes a large shrub. Western edge of Liebre Mountains. Also occurs in San Diego County.

SHRUB OAKS

California Scrub Oak (*Quercus berberidifolia*)
Below 5,000 feet. L, SM, SS, SG (western), V, C-P.
Evergreen. Sometimes a small tree. Canyons, foothills, dry slopes, mountains. The most common shrub oak in Los Angeles County. Frequent component in oak woodlands, chaparral, coastal sage scrub, and conifer forests.

Interior live oak (*Quercus wislizeni* var. *frutescens*)
Above 3,000 feet (2,100 feet in the SM). L, SG, SM (minor).
Evergreen, sometimes a tree. Mountain canyons and slopes. Component in oak woodlands, chaparral, and conifer forests.

Quercus agrifolia* x *Quercus wislizeni.
Approximately 3,000 feet. L.
Evergreen. Large shrubs. Montane Canyons.

San Gabriel Mountains leather oak (*Quercus durata* var. *gabrielensis*)
Between 1,500 and 3,300 feet. SG.
Evergreen. Endemic to the Los Angeles County. Canyons, slopes, ridges. Component in oak woodlands and chaparral.

Oregon Oak (*Quercus garryana* var. *breweri*)
Above 800 feet. L.
Deciduous. Limited to a few locations in the Liebre Mountains. Dry slopes. Component of chaparral and conifer forests.

Tucker's oak (*Quercus john-tuckeri*)
Above 2,900 feet. L, SG (north slopes).
Evergreen. Sometimes a small tree. Montane chaparral and desert-chaparral transition. Limited to the north slopes of the Liebre and San Gabriel Mountains.

***Quercus x alvordiana*. Hybrid of blue oak and Tucker's oak.**
Above 2,900 feet. L (northwest).
Semideciduous to evergreen. Shrub to small tree. Limited to the northwest Liebre Mountains, forming more extensive stands north of the County.

ISLAND OAKS

Island Oak (*Quercus tomentella*)
Santa Catalina Island, San Clemente Island. Canyons, ravines, moist slopes. Component of oak woodlands, chaparral, pine forest.

Channel Islands scrub oak (*Quercus pacifica*)
Santa Catalina Island.

MacDonald Oak (*Quercus x macdonaldii*). Hybrid of valley oak and California scrub oak
Santa Catalina Island.

ADD PHOTOS FOR EACH SPECIES IN NEXT DRAFT

DESCRIPTIONS OF OAK SPECIES PRESENT

***Coast Live Oak (*Quercus agrifolia*)

Form: The coast live oak is a picturesque evergreen tree 10-25 meters tall and a canopy spread of 45 meters in especially large specimens.

Leaves: This evergreen species has leaves that are usually oval to oblong in general outline with fine spiny teeth along the margins. The leaves are generally about 20-60 mm long with a texture is best described as crisp - they will break rather than bend. Mature leaves are usually convex but interior leaves that are heavily shaded may be flat and considerably larger than average; petioles 4-15 mm long.

Acorns: Acorns are 25-35 mm long and 10-14 mm wide with cups that are 8-12 mm long and 10-16 mm wide. The cups have thin, flat scales and are silky-hairy within.

Habitat: Common in foothills, canyons, valleys and mesic, usually north-facing, slopes. The coast live oak is also found on exposed slopes in the coastal zone where temperature and humidity extremes are moderated by the ocean. The species is usually found in well drained soils of the coastal plains and bluffs but may be found up to 5000 feet in inland canyons.

Range: The coast live oak is found primarily found along the coastal slope of the coast ranges from Mendocino County in the north into Baja California in the south. In several places the coast live oak crosses the coast ranges with populations along waterways on the inland side of the mountains in the central valley. In Southern California the species is found along the transverse range, in many inland valleys, and up to the 5,000-foot level in the local mountains. In Los Angeles County the coast live oak occurs in most of the county's mountains and foothills. The species is frequently associated with other oaks in the foothills of the San Gabriels and with California black walnuts and scrub oaks in the hills of the coastal plain such as the Elysian Hills and Puente Hills.

Notes: The coast live oak is the tree most native Southern Californians associate with the word "oak," the early Spanish explorers called the tree "encina" which accounts for many familiar place names in California.

***California Scrub Oak (*Quercus berberidifolia*)

Form: Evergreen shrub 1-6 meters tall. The scrub oak usually grows as a bush and often has many trunks originating from a basal burl. The trunks are not usually more than 15 cm in diameter and the shrub is usually less than 6 meters tall. Because of the many trunks growing in divergent directions from the burl, the canopy spread may be more than 12 meters. In some conditions, scrub oaks may

adopt a tree-like growth form, reaching heights of 9 meters and having trunk diameters up to 35 cm. This illustrates the variability of all morphological characteristics of the scrub oak.

•*Leaves:* 15-30 mm long, oblong to elliptic or somewhat rounded; margins mostly toothed, these often minute spine-tipped, or spinose; leathery, upper surface glabrate, green and shiny, lower surface paler and with scattered minute hairs; petioles 2-6 mm long.

Acorns: California scrub oak acorns are between 0.4 and 1.25 inches long, broadly elliptic or egg-shaped and broadest at the base and rounded at the tip that may be blunt or pointed. The cups are from 0.2 to 0.4 inch tall and 0.4 to 0.8 inch wide with heavy tubercles.

Habitat: California scrub oak occurs on dry slopes, hillsides, canyons, and mountains, usually in thin soils. Habitat associations include other oaks, chaparral, coastal sage scrub and yellow pine forest.

Range: The California scrub oak is found from the western slope of the central sierra Nevada foothills to lower (Baja) California and on the coast from Santa Barbara south through the Santa Monica Mountains through the Verdugo Hills, the foothills of the San Gabriels, and the Puente Hills.

Notes: Scrub oaks typically occur in stands growing close to one another and make up a significant part of the chaparral in many Southern California locations. Though often considered scrub or chaparral, stands of scrub oaks may also be identified as scrub oak woodland.

*****Canyon Live Oak (*Quercus chrysolepis*)**

Form: The canyon live oak is an evergreen tree that reaches nearly 70 feet in height. The canopy is rounded and about as wide as tall.

Leaves: Canyon live oak leaves are elliptical and 1 to 2.5 inches long with smooth margins on the older branches and toothed-spiny margins found on the leaves of younger branches and sprouts.

Acorns: The acorns are up to 2 inches ling with broad bases and large cups. The cups are from 0.2 to 0.5 inches long and from 0.7 to a little over 2 inches wide. When green the cups are covered with fine golden hairs.

Habitat: The species is common in canyons and slopes but is not generally found where heavy snows accumulate.

Range: Canyon live oak can be found in most mountain ranges from Oregon south into Baja California. In Los Angeles County the species is found throughout the San Gabriel Mountains and in the Santa Susanna Mountains.

*****Blue Oak (*Quercus douglasii*)**

Form: The blue oak is a medium sized tree, seldom exceeding 60 feet in height. It's canopy is well rounded when occurring in the lower foothill savanna areas but may be quite vertical in crowded woodlands.

Leaves: The leaves are 1 to 3 inches long and usually have wavy margins, though then may also have shallow, irregular lobes. The underside of the leaves is pale green minute hairs and the upper surfaces are dull dark green with a waxy coating that reduces desiccation and gives the tree its bluish color when viewed from a distance.

Acorns: The acorns are ¾ to 1.5 inches long, narrow and sit in small shallow cups (1/4 to ½ inch long and ½ to 1 inch wide) with tuberculate scales.

Habitat: Blue oaks usually occur below 3500 feet in foothills on the margins of hot interior valleys. They are generally found in soils that are not well developed and in areas where rainfall is less than 15 inches per year.

Range: Blue oak is limited to California but is widespread occurring in a broad ring around the central valley with scattered disjunct populations such as Sutter Buttes and the Channel Islands. In Los Angeles County the species occurs at Liebre Mountain, Oak Flat near Castaic, and on Catalina Island.

Notes: Blue oak may be the most abundant widespread oak in California and is adapted remarkably to the hot, dry foothills of the interior valleys. Many characteristics of the species are similar to desert plants, such as the waxy cuticle on the leaves, quick germination and root development with early rains, and drought deciduousness in extreme conditions.

***Nuttall's Scrub Oak (*Quercus dumosa*)**

Form: Evergreen or semi-deciduous shrub, 1-3 meters tall, with multiple trunks, intricate and dense, occasionally forming dense low, matted clumps; branches often sharply angled, sparsely short-haired and deep red-brown.

Leaves: 10-25 mm long, usually short, round in outline or slightly longer than broad; base rounded; tip with spine, or rounded; margin flat or wavy, with abruptly pointed teeth or spines; shiny green and sparsely minute-stellate hairy above, pale and dull green below, and covered with fine, densely matted gray hairs, these becoming sparse with age; petioles to 5mm long.

Acorns: Subsessile, or up to 3 mm; acorn cup bowl-shaped, 8-15 mm wide, 5-8 mm tall, scales flat, well defined to moderately tuberculate toward base; acorn nut 10-20 mm long, narrow, egg-shaped but tapering to a pointed tip, shell glabrous on inside

Habitat: Coastal hills, mesic slopes, canyons and coastal bluffs, chaparral, coastal sage scrub, maritime succulent scrub and closed pine forests

Range: Local, often common where found from southern Santa Barbara County, south along the immediate coast disjunctly through Orange County and San Diego County and beyond. Probably not

found in Los Angeles County, but oaks strongly influenced by this species may be found in the Verdugo Hills.

Notes: Much of what was once classified as *Q. dumosa* is now identified as *Q. berberidifolia*.

***San Gabriel Mountains Leather Oak (*Quercus durata var. gabrielensis*)**

Form: Evergreen shrub, 1-3 meters tall; twigs densely hairy.

Leaves: 15-30 mm long, leathery, oblong to elliptic in outline, slightly convex, margins entire (without lobes or teeth), irregular teeth, or with shallow lobes, often toothed, slightly inrolled; tip spine-tipped or abruptly pointed; upper surface dark green and with scattered minute, stellate hairs, lower surface paler, with long, dense minute stellate hairs; petioles hairy, less than 5 mm long.

Acorns: Sessile (lacking a stalk), or nearly so; acorn cup bowl-shaped, 4-6 mm long, 12-19 mm wide, scales tubercled; acorn nut 15-25 mm long, ovoid to cylindric, tip abruptly rounded, or with a short, tapered point, shell glabrous on inner and outer surface.

Habitat: Occasional to common in canyons, ridges, and on slopes; chaparral, canyon oak woodland.

Range: Endemic to Los Angeles County, southern slopes of San Gabriel Mountains, 450-1000 meters.

Notes: Considerable hybridization occurs with *Q. berberidifolia* and *Q. engelmannii* at east and west end of range.

*****Engelmann's Oak (*Quercus engelmannii*)**

Form: Engelmann oak is a large tree with a rounded or spreading crown that may reach heights of 60 feet. The canopy is generally not dense, with interior branches and the background visible through the crown when viewed from a distance. The trunk is up to 4 feet in diameter in the largest specimens with bark that is light gray, thick, heavily furrowed and somewhat scaly.

Leaves: The thick, leathery leaves are 1 to 3 inches long and elliptical with flat or wavy margins that do not have lobes, teeth, or spines. The upper surfaces are dull blue-green and lower are paler blue-green. Engelmann's oak is semi-deciduous, the leaves remaining on the tree until being replaced by the next year's new foliage. During drought the leaves may also drop, leaving the tree bare until the following spring.

Acorns: Engelmann oak acorns are cylindric to broadly ovate or elliptic and 0.6 to 1 inch long and nearly half contained within the cup. The cups are broad and shallow, about 0.4 inch wide and about 0.75 inch wide. The cups may be tuberculate near the base and covered with small dense hairs

Habitat: Engelmann oaks are found in a variety of soils from deep alluvium to thick, loamy, clays. They also occur in rocky shallow soils if there is a source of summer moisture. In their current distribution they are strongly associates with basalt derived mesas, though that may be an artifact of their elimination from many areas due to human factors.

Range: The northwestern limit of the species range is along foothills of the San Gabriels near Pasadena extending eastward along the foothills. There are scattered populations in the Santa Ana Mountains and San Joaquin Hills in Orange County. A larger more contiguous distribution begins at the Santa Rosa Plateau in Riverside County and continues southward through the Peninsular Range to northern Baja California, Mexico. In Los Angeles County the species occurs along the south face of the San Gabriel Mountains from near Pasadena to near the eastern county line.

Notes: Engelmann oak is a relict of a more mesic period in North American prehistory. The remaining stands are confined to areas the get enough moisture but are generally free of freezing temperatures and have mild summers. As a result, the Engelmann oak has been characterized as both the rarest white oak in California and the rarest tree oak in California.

***Oregon Oak (*Quercus garryana var. breweri*)**

Form: Deciduous rounded shrub 1-5 meters tall; twigs reddish brown.

Leaves: 50-90 mm long, leathery; longer than broad, elliptic in outline, often broadest above middle; margins with course lobes, these sometimes spine-tipped; the lobes mostly less than half way to midvein; base rounded to wedge shaped; tip rounded; margin with narrow, rounded lobes, these often 2-3 toothed; petioles 5-20 mm long.

Acorns: Sessile, or nearly so; acorn cup shallow, cup-shaped, or bowl-shaped 4-9 mm long, 12-16 mm wide; cup scales flat to weakly tuberculate, minutely hairy within; acorn nut 20-30 mm long, oval shaped to rounded, tip rounded; shell glabrous on inner surface, slightly minutely hairy on outer surface.

Habitat: Locally common on dry slopes in chaparral and yellow pine forest, often forming extensive brush fields.

Range: Northern Coast Ranges in Trinity and Plumas County south through foothills of the Sierra Nevada and Tehachapi Mountains south to northern Los Angeles County (Liebre Mountains 245-1800 meters).

***Tucker's Oak (*Quercus john-tuckeri*)**

Form: Evergreen shrub 2-5 meters tall, occasionally arborescent and up to 7 meters tall, branches rather slender, with densely matted, fine hairs when young.

Leaves: 15-35 mm long, shape highly variable, usually longer than broad, or with slightly egg-shaped outline, being broadest toward base; base rounded to wedge-shaped, rarely heart-shaped; tip rounded or abruptly pointed; margin with irregularly spaced spiny teeth; upper surface dull, gray to grayish-green, lower surface finely hairy and pale gray-green; petioles 2-3 rarely to 5 mm long.

Acorns: Sessile, or nearly so; acorn cup bowl-shaped or cup-shaped, 5-7 mm long, 10-15 mm wide, cup with scales, or slightly tuberculate; acorn nut dark brown, 2-30 mm long, narrow, to cylindric to broadly elliptic, tapering gradually, to the tip, shell glabrous on inner surface

Habitat: Mountains, chaparral, desert-chaparral transitional communities, pinion-juniper woodland, and Great Basin sage.

Range: Inner southern Coast Ranges from San Benito County south to the Tehachapi Mountains, southern Sierra Nevada, and the southeast along the desert slopes of the Transverse Ranges to the Little San Bernardino Mountains in Riverside and San Bernardino Counties. Occasional to common on arid slopes from the Lockwood Valley and Mount Pinos area east to Gorman and along the desert slopes of the San Gabriel and San Bernardino Mountains; mostly 900-2000 meters.

***California Black Oak (*Quercus kelloggii*)**

Form: Deciduous tree 10-25 meters tall; crown broad, rounded; trunk thick, bark smooth, dark, becoming ridged in age; twigs minutely hairy when young.

Leaves: 70-200 mm long; bright green, broadly elliptic in outline, often broadest above middle; base wedge-shaped; tip spinose-tipped; margin divided deeply into lobes, these often bearing 1-4 bristle-tipped teeth; bright green and mostly glabrous, paler and with trichomes below; petioles 25-50 mm long.

Acorns: Sessile, or nearly so; acorn cup deeply cup-shaped, 15-25 mm long, 20-28 mm wide; cup minutely hairy within, cup scales thin, flat, paper-like, often minutely hairy; acorn nut 25-30 mm long, thick, longer than wide, tip round with an abrupt small point; shell hairy on inner surface.

Habitat: Common in montane, yellow pine forest.

Range: Central western Oregon south through the Coast Ranges and the Sierra Nevada to central San Diego County. Mount Pinos, interior northern Ventura County, Liebre Mountains, eastern San Gabriel Mountains, San Bernardino Mountains, San Jacinto and Santa Rosa Mountains, Palomar, Cuyammaca and Laguna Mountains, disjunct into Mexico. 1200-2400 meters.

Notes: Fruit matures in 2 years.

*****Valley Oak (*Quercus lobata*)**

Form: A mature valley oak is a magnificent sight. The tree is typically 40 to 75 feet tall but may reach heights of 125 feet and has a canopy that is usually broader than tall.

Leaves: The leaves of this deciduous oak are pinnately lobed (lobes originate at the midrib) typically having 3 to 4 lobes on a side and are usually 3 to 4 inches long. The lobes often have 2-3 irregular teeth at the tip. The upper surface is shiny and dark green with sparse hairs and the lower is paler with short, dense, fine hairs.

Acorns: The large acorn may be 2 inches long and is contained in hemispheric cup that ranges from 0.5 to 1.2 inches deep by 0.75 to 1.2 inches wide. Cup scales are tuberculate.

Habitat: The species distribution is formed by the presence of rich loamy soils, Jepson (1923) noted the valley oak is often a "sign of the richest soil." This affinity for good soil is evidenced by its presence in the foothill valleys along either side of the Sacramento and San Joaquin Valleys.

Range: The valley oak is found as far north as the Trinity River in Shasta County and historically as far south as San Fernando in Los Angeles County. The valley oak is also known to occur farther south and west in the areas around Calabasas and Thousand Oaks. There are scattered populations on some Channel Islands and a hybridized population in the San Joaquin Hills of Orange County. Valley oak hybrids are known to occur with other white oaks. Two named hybrids exist, both with scrub oaks, *Q. x kinselae* with *Q. dumosa* and *Q. x macdonaldii* with *Q. berberidifolia*. Other hybrids such as with Tucker oak have also been noted. In Los Angeles County the valley oak is found primarily in the Santa Monica Mountains, and the 101 freeway is close to the southern extent of its range, although scattered individuals were formerly found in other areas of the County.

Notes: The valley oak was called "roble" by the Spanish and, like the coast live oak, has lent its name to many familiar places in Southern California. Unfortunately many of these places no longer support any oak trees.

****Channel Islands Scrub Oak (*Quercus pacifica*)**

Form: Subevergreen, shrubs, rarely small trees 2-5 meters tall; Bark scaly on older branches and trunk. Twigs brownish or reddish, minutely puberulent, becoming glabrate and gray with age.

Leaves: 15-45 mm long by 7-20 mm, obovate or oblong, planar to moderately convex or undulate; base cuneate, wedge-shaped, or sometimes rounded, attenuate-decurrent along petiole; margins minutely cartilaginous, entire or with 1-5 irregular teeth on each side; apex blunt or rounded, occasionally subacute with mucronate tip; with scattered minute, flat, appressed, ± 8-rayed stellate hairs, green, glossy, glabrate or with minute, scattered, stellate hairs. petioles 2-5 mm long. Trichomes on lower leaf surface longer and denser than *Q. berberidifolia*.

Acorns: Subsessile, paired or solitary in leaf axil; cup hemispheric to turbinate, to 15 mm deep by 20 (35) mm wide, scales moderately to heavily tuberculate, irregularly formed; acorn nut light brown, acute-cylindric or fusiform, tapered, 15-30 mm long by 6-15 mm, apex acute, glabrate.

Habitat: Chaparral, oak woodlands, margins of grasslands, understory in closed-cone pine stands.

Range: Santa Rosa, Santa Cruz, and Santa Catalina Islands to 300 meters.

Notes: Newly described (1994); appears intermediate between *Q. berberidifolia* and *Q. douglasii*.

***Island Oak (*Quercus tomentella*)**

Form: Evergreen tree 5-12 meters tall, often with rounded crown; bark red brown, scaly, becoming grayish and furrowed; young twigs yellowish, hairy.

Leaves: 50-80 mm long, leathery, slightly revolute with evident parallel veination, oblong to oblong-ovate in outline; base rounded to squared off; tapering to pointed tip, or abruptly pointed; margin mostly coarsely toothed; leaves densely hairy when young, in age upper surface shiny, deep green, lower surface pale gray-green, covered with dense grayish hairs; trichomes minute, yellowish to grayish; petioles 5-18 mm long.

Acorns: Sessile, or nearly so; acorn cup shallow to bowl-shaped, 6-8 mm deep, 20-30 mm wide; cup scales tuberculate, and almost obscured by small dense hairs; acorn nut 25-35 mm long, broadly ovoid, tip rounded; shell with densely matted hair on inner surface.

Habitat: Occasional to common in canyons, ravines, and on mesic slopes in oak woodland, chaparral and closed-cone pine forest.

Range: Channel Islands of southern California and south into Mexico. Santa Rosa, Santa Cruz, Anacapa, Santa Catalina and San Clement Islands to 600 meters.

Notes: Fruit matures in two years.

***Interior Live Oak (*Quercus wislizenii var. frutescens*)**

Form: Evergreen multi-stemmed shrub 2-6 meters tall, bark becoming furrowed and gray.

Leaves: 18-40 mm long, leathery, flat, oblong to elliptic or lanceolate in outline; base rounded to squared off, tip tapered to a point or abruptly pointed; margin entire, or with course spinose teeth; glabrous, upper leaf surfaces shiny and green, lower surface often paler and more yellow-green; petioles 3-15 mm long.

Acorns: Sessile, or nearly so; acorn cup deeply cup-shaped or bowl-shaped, 12-16 mm deep, 12-18 mm wide, scales evident, thin and flat; acorn nut 20-40 mm long, cylindric to broadly ovoid, tip tapering to a point, shell hairy on inner surface and minutely glabrous on outer surface.

Habitat: Mountain slopes, canyons; chaparral, oak woodland, bigcone Douglas fir-canyon oak forest, Coulter pine forest.

Range: Species is in Humboldt and Shasta Counties south through the Coast Ranges, Sierra Nevada Range, Transverse and Peninsular Ranges through San Diego County and south into Mexico. *Q. w. frutescens* scattered throughout the Santa Ynez Mountains east through the mountains of Ventura County and east into the San Gabriel and San Bernardino Mountains of Los Angeles County, the Santa Ana Mountains, San Jacinto Mountains and disjunctly south into San Diego County and Mexico. 850-2000 meters.

Notes: Fruit maturing in 2 years.

OAK COMMUNITIES OCCURRING IN LOS ANGELES COUNTY

The concept of an ecological or natural plant community, defined by Oosting in "The Study of Plant Communities" (1948) as "an aggregation of living organisms having mutual relationships among themselves and to the environment," takes into account both biological composition and the complex interactions that occur among species and their physical environment. Community processes, however, are not readily apparent or even fully understood and, as practical matter, both lay and professional observers generally rely on a more intuitive floristic definition such as that provided by Munz and Keck in "A California Flora" (1959), where a plant community is "each regional element of the vegetation that is characterized by the presence of certain dominant species." While based on floristic composition this definition nevertheless implicitly takes into account the environmental conditions and biotic processes that cause and result from recurrent plant assemblages.

This floristic definition of community is in wide use today, expressed as the Alliance (Series) and Association concept adopted by the National Vegetation Classification Standard (Jennings et al. 1996), the California Department of Fish and Game, and the California Native Plant Society (Sawyer and Keeler-Wolf 1995). Under this system an alliance is the generic unit of vegetation defined by the dominant and characteristic plant species in the layer of vegetation with the greatest plant cover. Alliances are often regional in extent and are named for a single dominant or less frequently, two equally codominant species. Associations are the fundamental vegetation units, localized to particular geographic subregions and clearly associated with certain environmental settings. Similar associations are grouped into alliances based on patterns of plant species dominance, similar to the way species are grouped into genera. Associations are defined by a dominant and one or more codominant or characteristic species.
The following Los Angeles County oak community listing is an attempt to document and illustrate the diversity of oak communities found in Los Angeles County based on a review of available literature. Vegetation alliances are those recognized by the California Department of Fish and Game (2007). The listed alliances and associations are drawn from local flora and vegetation descriptions (Boyd 1999, Hanes 1976, Keeler-Wolf and Evens 2006, Miles and Goudey 1997, Mullally 1997, Roberts 1996). While these sources collectively provide near complete geographic coverage of oak habitats in mainland Los Angeles County, there are undoubtedly additional community associations not included in this list. In addition, occurrences of associations may not be limited to only those locations for which a reference is cited. Island community types are not included in this listing.

Vegetation alliance groupings follow the "Southern California Mountains and Foothills Assessment" (Stephenson and Calcarone 1999). Listed locations are the Liebre Mountains (**L**), Santa Monica

Mountains and Simi Hills (**SM**), Santa Susana Mountains (**SS**), San Gabriel Mountains and foothills (**SG**), Verdugo Mountains (**V**) and the Chino and Puente Hills (**C-P**). A hyphen ("-") indicates codominant species occurring in the same layer while a slash ("/") indicates species occurring in different layers. The order of species names generally reflects decreasing levels of dominance, constancy, or indicator value.

Valley and Foothill Oak Woodlands

These low elevation (below 3,600 feet) oak communities are those most commonly encountered by Los Angeles County residents. They are common on north slopes, valley bottoms and along streams. Alliances include the ubiquitous Coast Live Oak Woodland, mixed with Engelmann oak in the San Gabriel foothills, and Valley Oak Woodland found in the western County. Communities occur as two distinct types. In valleys and on rolling hills they are generally open, often appearing as savanna. The understory is frequently grass, less commonly coastal sage and chaparral. In canyons and along streams communities occur as dense closed-canopy stands, where coast live oak and mixed oak riparian forests may develop (Stephenson and Calcarone 1999).

Coast Live Oak Woodland Alliance (L, SS, SM, SG, C-P)

Coast Live Oak
Coast Live Oak South Coastal Woodland (SM)
Coast Live Oak / Annual Grass – Herb (SS, SM, SG)
Coast Live Oak and Valley Oak / Grass (SS)
Coast Live Oak – Engelmann Oak (SG – Altadena to Claremont)
Coast Live Oak – Southern California Walnut (SM, SS, SG)
Coast Live Oak and Southern California Walnut and California Ash (SS)
Coast Live Oak and California Ash (SS)
Coast Live Oak / Poison Oak (SM, SS)
Coast Live Oak / Poison Oak – Bush Monkey Flower Phase (SM)
Coast Live Oak / Creeping Snowberry (SS)
Coast Live Oak – Arroyo Willow (SM, SS)
Coast Live Oak – California Bay (SM)
Coast Live Oak – California Bay / Hairy Leaf Ceanothus (SM)
Coast Live Oak / Chamise (SM)
Coast Live Oak / California Scrub Oak (SM)
Coast Live Oak / Greenbark Ceanothus (SM)
Coast Live Oak / Toyon – Poison Oak (SM, SS)
Coast Live Oak / Purple Sage – California Sagebrush (SM)
Coast Live Oak and Coastal Sage (SS)

Valley Oak Woodland Alliance (L, SM, SS)

Valley Oak / Annual Grass – Herb (SM)
Valley Oak – Coast Live Oak / Annual Grass – Herb (SM, SS)
Valley Oak and Southern California Black Walnut/Grass (SS)
Valley Oak/Coastal Sage Scrub (SS)
Valley Oak and California Ash (SS)

Canyon Live Oak Woodland Alliance (SS) – Transitional to montane oak woodlands

Canyon Live Oak and Coast Live Oak (SS)
Canyon Live Oak and Coast Live Oak and Valley Oak (SS)
Blue Oak Woodland Alliance (L)

Montane Oak Woodlands.

These high elevation (above 3000 feet) woodland communities are of limited distribution in Los Angeles County and because they occur only in the upper elevations of the San Gabriel and Liebre Mountains, are infrequently encountered. Oak stands are often mixed with conifers, and oaks often occur as associates within a conifer alliance. Live oaks can be shrub-like in uplands and occur as tall spreading trees along streams (Stephenson and Calcarone 1999).

Black Oak Woodland Alliance (L)
Canyon Live Oak Woodland Alliance (L, SS?, SG)
Interior Live Oak Alliance (SG)
Mixed Oak Woodland Alliance (L)

Scrub Oak Chaparral

Scrub oak is an important, widespread component of chaparral, with communities occurring from sea-level up to 5000 feet. It forms dense closed canopy stands, often in association with other chaparral shrub species. Shrub can occasionally take the form of a small tree.

Scrub Oak Shrubland Alliance (L, SM, SS, SG, V, C-P)
Scrub Oak (L, SM, SS, SG, V, C-P)
Scrub Oak – Greenbark Ceanothus (SM)
Scrub Oak – Interior Live Oak Shrub (SG)
Scrub oak – Chamise Shrubland Alliance (L, SM)
Scrub oak – Birchleaf Mountain Mahogany Shrubland Alliance (L, SM)
Scrub Oak – Chaparral Whitethorn Alliance (L, SG)

Montane Live Oak Scrub

These communities generally occur above 4,000 feet (interior live oak occurs above 2,000 feet in the Santa Monica Mountains). They are dominated by the shrub forms of canyon and interior live oak, although tree forms may sometimes occur. They are associated with higher elevation chaparral species.

Canyon Live Oak Shrubland Alliance (L)
Interior Live Oak Shrubland Alliance (L, SM, SS)
Interior live oak – scrub oak (L)
Interior Live Oak – Canyon Live Oak Shrub (L)

Other Vegetation Types Containing Oaks

Oaks are an ubiquitous element in plant communities of Los Angeles County, where they can occur as individuals or small stands in alliances otherwise dominated by other species. Coast live oak in particular occurs in many chaparral types and is common in riparian areas where it forms associations within sycamore, willows and California bay alliances, such as the Sycamore – Coast Live Oak Association of the Santa Monica and Santa Susana Mountains.

Latin Names for Non-oak Species Listed:

Arroyo Willow	*Salix lasiolepis*
Birchleaf Mountain Mahogany	*Cercocarpus betuloides*
Bush Monkey Flower	*Diplacus aurantiacus*
California Ash	*Fraxinus dipetala*
California Bay	*Umbellularia californica*
California Black Walnut	*Juglans californica*
California Sagebrush	*Artemisia californica*
Chaparral Whitethorn	*Ceanothus leucodermis*
Chamise	*Adenostoma fasciculatum*
Creeping Snowberry	*Symphoricarpos mollis*
Greenbark Ceanothus	*Ceanothus spinosus*
Hairy Leaf Ceanothus	*Ceanothus oliganthus*
Poison Oak	*Toxicodendron diversilobum*
Purple Sage	*Salvia leucophylla*
Toyon	*Heteromeles arbutifolia*

Glossary:

arborescent- tree like
glabrate- generally lacking hairs, nearly glabrous
glabrous- without hairs
glaucous- waxy
lanceolate- longer than wide and broadest toward the base
oblong- longer than wide and with parallel sides, rounded at both tip and base
obovate- an egg shaped outline, broadest toward leaf tip
petiole- leaf stalk
revolute- edges inrolled
sessile- lacking a stalk
spinose- bearing spines
stellate- rayed like a many-armed star
trichomes- minute stellate hairs
tuberculate- warty

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APPENDIX 5

OAK REVEGETATION STRATEGY
For Los Angeles County

Excerpted and summarized from:

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Prepared for:
County of Los Angeles Fire Department
Forestry Division

Sponsored by:
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OAK REVEGETATION STRATEGY

Purpose

While the gradual disappearance of oaks was hardly notices for nearly two centuries, concern of the past years has grown enough to establish active preservation and enhancement programs. In 1982, Los Angeles County passed the Oak Tree Ordinance. As with similar ordinances in several southern California cities, it original intent was simply to require developers to preserve oaks existing on their development sites. Since this often presented considerable difficulties, the ordinance included a provision for planting two or more oak seedlings on the same site or nearby to replace any trees removed.

With experience, it became apparent that ideal conditions for planting oaks often did not exist on the same site, and that the trees might be better established elsewhere. In lieu of planting trees on the same site, a number of additional alternatives have been developed by the county. Developers may be permitted to dedicate one acre of land of equal resource value to the county for every acre of oak woodland that they wish to develop. Mitigation efforts at off site locations have been an option in recent years. Careful planning to preserve oak woodland on site however is still the recommended management alternative.

As another alternative for special circumstances, the county established the Oak Forests Special Fund in 1993. After careful review by the county and approval by the county foresters, in lieu of planting trees, developers could now pay into the fund an amount equivalent to the value of the oak resource in compensation for removing oaks. The fund could be used to acquire established oak woodland for preservation, to improve existing habitat or to plant trees in appropriate locations. The, the original limited purpose of the Oak Tree Ordinance expanded to include both land acquisition and land revitalization. This expansion of purpose also suggests a focus not merely on protecting and replacing individual trees but on preserving and establishing plant communities.

Regeneration of Oak Woodland

This expanded focus suggests and even larger framework of possibilities. Alternative mitigation strategies available could be the beginning of an effort to reestablish oak woodland throughout its original natural range in the still undeveloped portions of southern California foothills. Environmental benefits can be great, among them:

- Species diversity and wildlife populations will increase.
  Oak woodland constitutes much richer habitat than the scrub communities that have replaced it. Oaks are among species supporting the greatest diversity and largest numbers of wildlife.

- Erosion control will be enhanced.
  Flood waters and eroded soils flowing from foothills and lower mountain slopes into the urbanized valleys would decrease because oaks are less vulnerable to fire than most

other native species when well maintained. They effectively hold soil in place and allow increased soil absorption of rainwater near where it falls. Oaks furthermore speed the processes of soil formation by retaining moisture in contact with the underlying rock.

- Carbon dioxide absorption and oxygen production will increase.
  This increase will be in increments that can be significant in improving the region's air quality, while reducing greenhouse effects.

- Intensities of wildfires will likely be reduced.
  In comparison with the heavily fueled, intense fires that are now common, newly established stands of oaks can form buffers between suburban areas and wildlands.

- Recreational uses will be much improved.
  Cool, shaded landscapes of oak woodland invite greater use.

Questions for Research and Planning

The time has come to provide a strategy and a means of focusing the efforts to reestablish oaks into a larger, coordinated program.

In order to accomplish this, the following questions were considered:

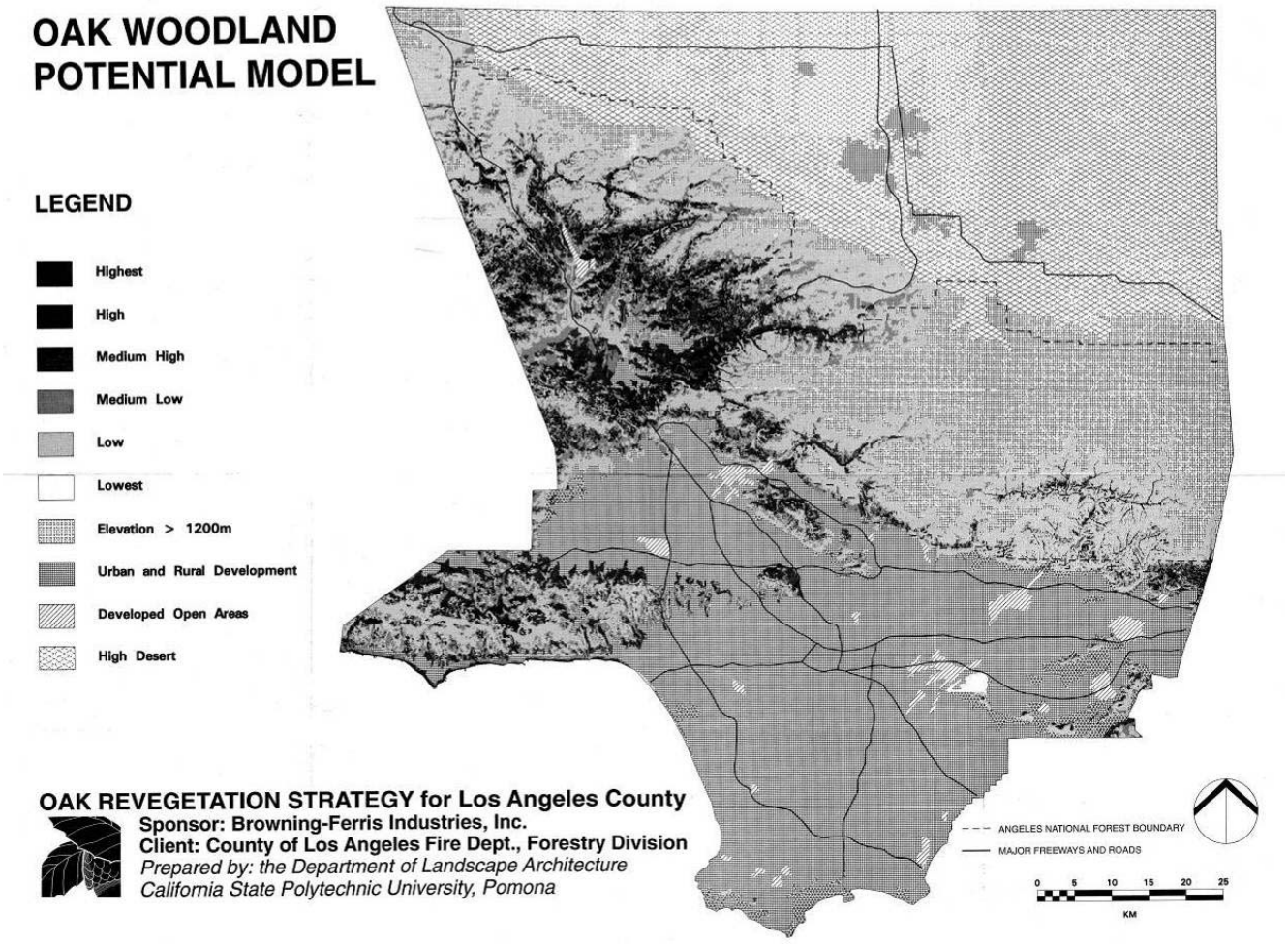
- Which conditions optimally allow oak woodland to thrive, and continue to thrive on their own after an initial period of planting and nurturing?

- Where do optimal conditions exist in Los Angeles County? Where have oaks existed historically and therefore are most readily restored?

- Which plant associations form oak woodland communities under varied topographic conditions and hydrologic regimes?

- Which are the most effective planting and management techniques?

Oak Woodland Potential Model



Methods

Identifying Optimal Conditions

A key premise for identifying optimal conditions is that existing remnant stands of oak woodland are to be found generally in areas with favorable combinations of conditions. Thus, if we can identify places where oaks are growing now or where they are known to have grown, we can determine the array of characteristic conditions most favorable for survival and regeneration. We can infer that these attributes will be most conducive to establishing oaks. This information will make it possible to concentrate oak planting where it is most likely to succeed and to lead to self-propagation of oak woodland.

Variables considered included:

VARIABLE	DATA SOURCE USED
Soil type	U. S. Soil Conservation Service soil reports
Slope classification (by percentage)	USGS 1:250,000 scale (Digital/ DEM)
Slope aspect (direction facing)	USGS 1:250,000 scale (Digital/ DEM)
Elevation (100 meter intervals)	USGS 1:250,000 scale (Digital/ DEM)
Streambeds	USGS 1:250,000 scale (Digital/ DEM)
Stream environs (zone 50 meters wide centered in blue line streambeds)	USGS 1:250,000 scale (Digital/ DEM), buffer polygon created within ARC/INFO
Fire History	LA County Fire Department records since 1919

*Note Data is based on 90 meter grid cells

The Wieslander maps were used as the base layer and the variable layers were combined by attribute. After accounting for the total amount of each variable on the site, mathematical calculations provided a number representing the density of oaks occurring on any one particular attribute. These densities were then ranked from high to low, revealing degrees of preference shown by oaks for a particular variable.

Results showed strong consistent relationships between coast live oak woodland and three variables: elevation, slope aspect and zones of streambeds. Relationships with slope classes were weak but significant. Comparisons of oaks to soil types showed no preference pattern. The results confirmed that there are differences between inland and coastal areas in the distribution of oaks.

After analyzing the differences, however, the research team concluded that the best criteria for application to the county as a whole were those resulting from the study done of the Malibu Creek Watershed site. Where the results of the Sunshine Canyon study site differed from these, the differences were explainable by locally anomalous conditions.

When used to create a map for the County, the model criteria rankings form the basis for determining the best general locations for replanting oak woodland at the regional scale. The map model of these potential woodland sites is the Oak Woodland Potential Model for Los Angeles County

RESULTS

While the purpose is to identify best locations for future planting, the Oak Woodland Potential Model also suggests a geographic pattern of oak woodland that existed prior to modern development. It is important to understand that this model is by no means definitive. Rather, it presents a pattern derived through orderly analyses of the best information available (as of 1997). As more precise information becomes available from site-specific analysis, that information can be examined in light of the existing map and adapted accordingly.

It is important to recognize that the Oak Woodland Potential Model presents a general pattern, not a precise delineation of sites. Its purpose is to provide broad indication of areas within Los Angeles County where coast live oak woodland might be most easily and cost-effectively established. In fact, coast live oaks grow on all different solar aspects, but he model shows oaks growing much more frequently on some aspects than others. Thus, the distinction is a matter of "more or less", which leads to a general pattern and not to precise delineation.

Two study areas were selected for the Lyle and Safford analysis and represent Interior Transverse Range (sunshine Canyon) and Coastal Transverse Range (Malibu Creek Watershed). Details of the results from each of the two study sites can be found in Appendix 2 of Lyle and Safford, 1997.

Figure 1. Percentage of land within Los Angeles County within the Six Potential Levels of Restoration (1997)

Level of Potential for Oak Woodland Restoration	**Percentage of LA County**	**Square Kilometer Area (10,654 total)**
Highest	0.9	94
High	2.1	228
Medium High	3.3	352
Medium Low	5.9	630
Low	13.8	506
Lowest	4.8	1472
Not suitable (urban, suburban, rural and high desert)	69.2	Elevation >1,200m = 1222 Urban-rural Dev = 2972 Dev Open Area=278 High desert=2900

These rankings were based on the following criteria:
(Areas excluded from the criteria but shown on the Oak Woodland Potential Model map include areas with an elevation higher than 1,200 meters, urban, suburban and rural developed open areas, high desert and 0-300 meter elevation zones.)

Interior Transverse Range Model Criteria:

Highest:
Flat aspect and 100 meter wide stream buffer
North and Northwest aspects, and 500-700 meter elevation

High:
North and Northwest aspects, and 400-500 or 700-800 meter elevations
Flat and Northeast aspects, and 500-700 meter elevation

Medium High:
North and Northwest aspects, and 300-400 or 700-800 meter elevation
Flat and Northeast aspects, and 400-500 or 700-800 meter elevation
East, Southeast, and Southwest aspects, and 500-700 meter elevation

Medium Low:
North and Northwest aspects, and 900-1100 meter elevation
Flat and Northeast aspects, and 300-400 or 800-900 meter elevation
East, Southeast, and Southwest aspects, and 400-500 or 700-800 meter elevation
West and South aspects, and 500-700 meter elevation

Low:
Flat and Northeast aspects, and 900-1100 meter elevation
East, Southeast, and Southwest aspects, and 300-400 or 800-900 meter elevation
West and South aspects, and 400-500 or 700-800 meter elevation

Lowest:
East, Southeast, and Southwest aspects, and 900-1100 meter elevation
West and South aspects, and 300-400 or 800-1100 meter elevation
All slopes greater than 60%
All elevations over 1100 meters.

Coastal Transverse Range Model Criteria:

Highest:
Flat aspect and 100 meter wide stream buffer.
North and Northwest aspects, and 0-200 meter elevation

High:
North and Northwest aspects, and 200-400 meter elevations
Flat and Northeast aspects, and 0-200 meter elevation

Medium:
North and Northwest aspects, and 400-900 meter elevation
Flat and Northeast aspects, and 200-400 meter elevation

East, Southeast, and Southwest aspects, and 0-200 meter elevation

Low:
Flat and Northeast aspects, and 400-900 meter elevation
East, Southeast, and Southwest aspects, and 200-400 meter elevation
West and South aspects, and 0-200 meter elevation

Lowest:
East, Southeast, and Southwest aspects, and 400-900 meter elevation
West and South aspects, and 200-900 meter elevation
All slopes greater than 60%

A summary analysis of each variable identified revealed the following results:

SLOPE: The position of oak woodlands in the field study was found to be narrowly correlated to slope steepness. Based on field observation, slope did not appear to be a primary determining factor in oak distribution.

ASPECT: Aspect is an important factor in the distribution of oak woodland. Aspect influences soil moisture, sun/shade relationship and other microclimate factors. The aspects observed to be most favored by oaks extended from the northeast, through the north to the northwest. Quercus sp. were absent from all southern exposures except where drainage channels were present.

DRAINAGE: The drainage is an influential factor in oak woodlands. Quercus sp. were observed in close proximity to drainage areas. Seasonal swales and the tops of watershed are key Quercus sp. habitat areas. Along riparian zones, the trees occurred on higher, well-drained ground.

MOISTURE; Moisture availability appeared to be a determining factor in Quercus sp. habitats. Moister is influenced by slope, aspect, drainage, microclimate, and soil. Based on observations, Quercus sp. preferred a medial level of moisture compared to the xeric chaparral and the mesic riparian vegetation. However, where moisture levels were higher, denser populations of oaks were found.

ASSOCIATED PLANT COMMUNITIES: The associated plant communities often found adjacent to the oak woodland include riparian woodland, chaparral, coastal sage scrub and grasslands. The observed understory included grass and shrub species. The composition of the adjacent plant communities did not seem to have a bearing on Quercus sp. distribution. However, Quercus sp. seemed to influence the adjacent communities through alteration of microclimate conditions and resource competitions.

OUTSIDE IMPACTS: Many impacts on the oak communities were observed. The clearing of vegetation for various development activities has impacted soil stability, drainage, soil depth and the continuity of established groves. Cattle grazing had a great impact as oak seedlings are grazed along with low-hanging foliage. Soils also become compacted as the result of cattle activity. Other possible negative impacts might stem from air pollution, degraded water quality, and climatic variations.

FIRE: Older trees exhibited evidence of past fires. The role of fire is an important, yet not fully understood factor. Fire suppression leads to an accumulation of litter and snags, thus potentially increasing the fire risk to this community type.

COMMUNITY SUCCESSION: Quercus sp do not seem to be dependent on other communities for their survival. Once an oak woodland is established, it perpetuates itself through the regulation of microclimate the provide protection for young Quercus sp and saplings. Observations suggest that the new Quercus sp growth takes place in the drip line of established trees.

SPATIAL AND VISUAL ANALYSIS: The Quercus sp observed were denser in canyons and more sparsely spaced on ridges due to exposure to wind and more sunlight. Through the edges between oak woodland and other vegetation types are important ecotones biologically, the change between the communities appears to be abrupt.

APPLYING THE STRATEGY FOR RESTORATION

IV. Site Specific Application

Once a site has been identified as being within a potential restoration zone, then a parcel level analysis that incorporates specific factors such as fire history, geology, location and specific condition of existing oak woodland (stand age, diversity, health, etc.) will be needed.

V. Define Suitable Plant Associations

Each oak revegetation project will include the community of plants associated with the oaks in that location. Selection and planting of oak associated understory plants shall be part of the restoration design.

VI. Planting and Management Guidelines

The planting plan that includes layout, plant propagation and establishment goals needs to be developed. Random spacing and cluster configuration patterns should mimic nearby stands.

VII. Replacing oak woodland habitats

The ability to recreate any lost ecosystem is fraught with difficulty. The complexity and diversity of oak woodland habitats make them particularly problematic to restore to a self-sustaining fully functional level. There are examples of successful oak tree planting, but there is currently no example of a successful oak woodland restoration in Los Angeles County.

A study done of the effectiveness of tree planting to mitigate habitat loss in a blue oak woodland used models to evaluate restoration of oak habitat using a variety of tree densities and management intensity (Standiford, McCreary and Frost 2002). Using data collected for ten years on a blue oak plantation, it was found that at the highest level of management and a planting density of 200 trees per acre, it would take ten years following planting to reach the ten percent canopy cover criteria for woodland under optimal site conditions.

This sobering reminder of the limitations of restoration planting underscores the need to retain existing functional oak woodlands.

APPENDIX 6

LOS ANGELES COUNTY
OAK TREE PROTECTION ORDINANCE
INFORMATION

&

COMPATIBLE PLANTS LIST

Prepared by:

Los Angeles County Forestry Division
Environmental Review Unit

Mike Takeshita
Kelly Kim
William Romo
Rosi Dagit
Christy Cuba

Additional information of the Oak Tree Protection Ordinance may be found at:

http://Fire.lacounty.gov/forestry/environmentalreview-oaktreeordinance.asp

for regional assistance on oak related identification:

http://Fire.lacounty.gov/fireprevention/fireprevcontacts.asp

Or contact your regional office directly:

Brush Clearance Unit 605 N. Angeleno Avenue Azusa, CA 91702-2904 (626) 969-2375	**Lake Hughes Forestry Unit** 42150 N. Lake Hughes Road Lake Hughes, CA 93532-9706 (661) 724-1810
Camp 17 6555 Stephens Ranch Road La Verne, CA 91750-1144 (909) 593-7147	**Malibu Forestry Unit** 942 N. Las Virgenes Road Calabasas, CA 91302-2137 (818) 222-1108
Environmental Review Unit 12605 Osborne Street Pacoima, CA 91331-2129 (818) 890-5719	**San Dimas Forestry Unit** 1910 N. Sycamore Canyon Road San Dimas, CA 91773-1220 (909) 599-4615
Fire Plan/Interpretive Unit 12605 Osborne Street Pacoima, CA 91331-2129 (818) 890-5783	**Saugus Forestry Unit** 28760 N. Bouquet Canyon Road Saugus, CA 91390-1220 (661) 296-8558
Fuel Modification Unit 605 N. Angeleno Avenue Azusa, CA 91702-2904 (626) 969-5205	**Vegetation Management Unit** 12605 Osborne Street Pacoima, CA 91331-2129 (818) 890-5720
Henninger Flats Forestry Unit 2260 Pinecrest Drive Altadena, CA 91001-2123 (626) 794-0675	

The Los Angeles County Oak Tree Ordinance

The Los Angeles County Oak Tree Ordinance has been established to recognize oak trees as significant historical, aesthetic, and ecological resources. The goal of the ordinance is to create favorable conditions for the preservation and propagation of this unique and threatened plant heritage. By making this part of the development process, healthy oak trees will be preserved and maintained.

The Los Angeles County Oak Tree Ordinance applies to all unincorporated areas of the County. Individual cities may have their own ordinances, and their requirements may be different. Permit Requirements: Under the Los Angeles County Ordinance, a person shall not cut, destroy, remove, relocate, inflict damage, or encroach into the protected zone (see text) of any ordinance sized tree of the oak tree genus without first obtaining a permit.

Damage includes but is not limited to :

- Burning
- Application of toxic substances
- Pruning or cutting
- Trenching
- Excavating
- Paving
- Operation of machinery or
- equipment
- Changing the natural grade
- Chapter 22.56.2050: Oak Tree Permit Regulations, Los Angeles County, Adopted: August 20, 1982. Amended: September 13,1988.

For more information about the County Oak Tree Ordinance, visit the Forestry Division's website at: http://lacofd.org/Forestry.asp

or contact:

Department of Regional Planning
320 W. Temple Street, 13th floor
Los Angeles, CA 90012-3284
(213) 974-6411
TDD: (213) 617-2292
http://planning.co.la.ca.us

Many kinds of oak trees are native to Los Angeles County. All oak trees are covered by the Oak Tree Ordinance. Older oaks which have thrived under the natural rainfall patterns of dry summers and wet winters often can't handle the extra water of a garden setting. These trees must be treated with special care if they are to survive. Those oaks that have been planted into the landscape or sprouted naturally tend to be more tolerant of watered landscapes. These vigorous young trees may grow 1½ to 4 feet a year in height under good conditions. Once established these trees would benefit from the same special care outlined in this guide.

THE PROTECTED ZONE

The protected zone defines the area most critical to the health and continued survival of an oak tree. Oaks are easily damaged and very sensitive to disturbances that occur to the tree or in the surrounding environment. The root system is extensive but surprisingly shallow, sometimes radiating out as much as 50 feet beyond the spread of the tree leaves, or canopy. The ground area at the outside edge of the canopy, referred to as the drip line, is especially important: the tree obtains most of its surface water and nutrients here, and conducts an important exchange of air and other gases. The protected zone is defined in the Oak Tree Ordinance as follows:

"The Protected Zone shall mean that area within the drip line of an oak tree and extending there from to a point at least 5 feet outside the drip line or 15 feet from the trunk, whichever distance is greater."

CHANGES IN THE GRADE

Any change in the level of soil around an oak tree can have a negative impact. The most critical area lies within 6' to 10' of the trunk: no soil should be added or scraped away. Water should drain away from this area and not be allowed to pond so that soil remains wet at the base. Retaining walls designed to hold back soil above or below an existing tree should avoided if at all possible, especially within the protected zone. These types of structures cause critical areas at the drip line to be buried, or require that major roots be severed. Water trapped at the base of the tree could lead to root rot or other impacts, and to the decline and premature death of a highly valued landscape tree. Construction activities outside the protected zone can have damaging impacts is on existing trees .Underground water sources can be cut off due to falling water tables, or drainage may be disrupted. Trenching Digging of trenches in the root zone should be avoided. Roots may be cut or severely damaged, and the tree can be killed. If trenches must be placed within the protected zone, utilities can be placed in a conduit, which has been bored through the soil, reducing damage to the roots. Insist that as many utilities as allowed be placed in a single trench, instead of the common practice of digging a separate trench for each individual line. Trenching can also be accomplished using hand tools or small hand held power equipment to avoid cutting roots. Any roots exposed during this work should be covered with wet burlap and kept moist until the soil can be replaced. Soil Compaction and Paving The roots depend upon an important exchange of both water and air through the soil within the protected zone. Any kind of activity that compacts the soil in this area blocks this exchange and can have serious long-term negative effects on the tree. If paving material must be used, some recommended surfaces include brick paving with sand joints, or ground coverings such as wood chips (note the advantages of natural materials for providing nutrients under mulching).

CONSTRUCTION ACTIVITY WITHIN THE PROTECTED ZONE

WATERING

The key is prevention – do not over water. Improper watering is often overlooked as the cause of tree death because it can take years for the damage to show. Once the tree shows obvious signs of decline, it is often too late to correct the problem. The seasonal weather pattern for this region is one of dry summers and winter rain. Oak trees are naturally drought tolerant and adapted to this cycle. If the tree is vigorous and thriving it should not require any additional water. If the natural source of surface or underground water has been altered, some supplemental water may be necessary, but proceed with caution. The goal of any watering schedule for oak trees should be to supplement natural rainfall and it should occur only when the tree would normally receive moisture. This might be in the winter, if rains are unusually late, or in spring if rainfall has been below normal levels. Over watering, especially during the summer months, causes a number of problems which can lead to decline and eventual death of the tree. It creates ideal conditions for attacks of Oak Root Fungus by allowing the fungus to breed all year. In addition, both evergreen and deciduous oaks grow vigorously in the spring and naturally go dormant in the summer. Extra water only encourages new tip growth which is subject to mildew. Oaks need this period of rest. Newly planted oaks may need supplemental watering during their first few summers. After they become established water should be applied according to the previous guidelines.

PRUNING

For oak trees the periodic removal of dead wood during periods of tree dormancy should be the only pruning needed. Any cutting of green wood opens scars that could allow the entry of organisms or disease. Before pruning obtain the advice of a certified arborist or other professional and consult the local city or county where the tree is located to find out what regulations apply. Pruning of both live and dead wood can sometimes require a permit.

MULCHING

Leaf litter from the tree is the best mulch and should be allowed to remain on the ground within the protected zone. Crushed walnut shells or wood chips can be used, but the oak leaves that drop naturally provide the tree with a source of nutrients. Avoid the use of packaged or commercial oak leaf mulch which could contain Oak Root Fungus. Redwood chips should not be used due to certain chemicals present in the wood.

MAINTENANCE

Disease and Pests Trees that are stressed, especially because of improper watering practices, are prone to certain diseases and attacks by pests. The most damaging of these diseases is the Oak Root Fungus Armillaria mellea. Occurring naturally in the soil, the fungus thrives under wet conditions and dies back in the summer when soils dry out. This is why summer watering of oaks can be a deadly practice. As noted in the watering guidelines, wet

soil in the summer allows the fungus to grow all year. As the population grows, their natural food sources are depleted and they begin feeding on oak tree roots. The fungus does not require an open wound in the tree to gain entry. Indications of the fungus include:

- die back of branches or tips.
- honey colored fungus at or near the root crown.
- white fan-like fungus between wood and bark.
- the presence of black, shoestring-like growths in the soil.

Once the tree begins to show obvious signs of infection treatment is generally ineffective. The best treatment is to avoid the conditions that lead to Oak Root Fungus infections. Pit Scale, Oak Moth, and other pests: any significant changes in leaf color, branch die back, presence of black sooty materials on leaves or other changes should be noted. Seek the advice of a professional forester, arborist, farm advisor or other expert before the application of any pesticides on an oak tree.

PLANTING UNDERNEATH OAKS

The natural leaf litter is by far the best ground cover within the protected zone. If plants must be placed, the following guidelines should be followed: There should be no planting within a minimum 6 to 10 feet of the trunk. Avoid plants that require any supplemental water once established.

COMPATIBLE NATIVE PLANTS AROUND OAKS IN THE SANTA MONICA MOUNTAINS

Recommended by the California Native Plant Society

TREES

Cercis occidentalis	Western Redbud
Heteromeles arbutifolia	Toyon
Juglans californica	California Walnut
Quercus agrifolia	Coast Live Oak
Quercus lobata	Valley Oak
Sambucus mexicana	Mexican Elderberry+
Umbellularia californica	CA Bay

SHRUBS

Adenostoma fasciculatum	Chamise
Amorpha californica	False Indigo
Artemisia californica	California Sagebrush
Baccharis pilularis consanguina	Coyote Bush*
Baccharis salicifolia	Summer Holly
Ceanothus sp.	California Lilac
Cercocarpus bettuloides	Mountain Mahogany
Diplacus(Mimulus) longiflorus	So. Bush Monkey Flower
Erigonium fasciculatum	California Buckwheat*
Isomeris arborea	Bladder-pod
Malosma laurina	Laurel Sumac
Prunis ilicifolia	Holly-leaf Cherry
Quercus dumosa	Scrub Oak
Quercus wizlizenii	Interior Live Oak
Rhamnus californica	California Coffeeberry
Rhamnus crocea	Redberry
Rhus ovata	Sugar Bush
Rhus trilobata	Squaw Bush
Ribes aureum	Golden Current
Ribes californicum	Hillside Current
Ribes malvaceum	Chaparral Current+
Ribes speciosum	Fuchsia-flowering Gooseberry
Salvia apiana	White Sage
Salvia mellifera	Black Sage
Symphoricarpus mollis	Snowberry

PERENNIALS	
Achillea millefolium	Yarrow
Asclepias eriocarpa	Indian Milkweed
Asclepias fascicularis	Narrow-leaved Milkweed
Delphinium parryi	Blue Larkspur
Delphinium patens	Blue Larkspur
Dodecatheon clevelandii	Shooting Star
Dudleya cymosa	Lax Dudleya
Dudleya lanceolata	Lance Live Forever
Dudleya pulverulenta	Chalk Dudleya
Encelia californica	California Bush Sunflower
Erigonium elongatum	Wand Buckwheat
Eschscholzia californicum	California Poppy
Gnaphalium californicum	California Everlasting
Grindelia robusta	Gum Plant
Keckiella (Penstemon) cordifolia	Climbing Penstemon
Lupinus longiflorus	Bush Lupine
Penstemon centranthifolius	Scarlet Bugler
Penstemon heterophyllus	Foothill Penstemon
Potentilia glandulosa	Sticky Cinquefoil
Salvia spathacea	Hummingbird Sage*
Satureja douglasii	Yerba Buena
Scophularia californica	California Figwort
Scutellaria tuberosa	Skull Cap
Sidalcea malvaeflora	Common Checkerbloom
Sisyrinchium bellum	Blue-eyed Grass
Solanum xantii	Purple Nightshade
Thalictrum polycarpum	Meadow Rue*
Viola pedunculata	Johnny Jump Up
Zauschneria californica	California Fuschia*

ANNUALS	
Calandrina ciliata menziesii	Red Maids
Clarkia bottae	Clarkia
Clarkia unguiculata	Elegant Clarkia
Collinsia heterophylla	Chinese Houses
Eschscholzia caespitosa	Collarless Poppy
Lasthenia chrysostoma	Gold Fields
Layia platyglossa campenstris	Tidy Tips
Lupinus succulentus	Succulent Lupine
Nemophilia menziesii	Baby Blue Eyes
Orthocarpus densiflorus	Owls Clover
Orthocarpus purpurascens	Owls Clover
Platystemon californicum	Cream Cups

Salvia columbariae	Chia
BULBS	
Bloomeria crocea	Golden Stars
Brodiaea(Dichelostemma) pulchella	Blue Dicks
Calochortus albus	White Globe Lily
Calochortus catalinae	Catalina Mariposa Lily
Calochortus clavatus	Yellow Mariposa
Zigadenus fremontii	Star Lily
FERNS	
Dryopteris arguta	Downy Wood Fern
Pellaea mucronata	Bird's Foot Fern
Pityrogramma triangularis	Goldback Fern
Polypody californicum	California Polypody
PERENNIAL GRASSES	
Agrostis diegoensii	San Diego Bent Grass
Bromus carinatus	California Brome
Bromus pseudolaevipes	Woodland Brome
Elymus condensatus	Giant Wild Rye
Elymus glaucus	Western Rye Grass
Elymus triticoides	Creeping Wild Rye
Melica imperfecta	Chaparral Melica
Muhlenbergia rigens	Showy Deer Grass
Stipa cernua	Spear Grass
Stipa lepida	Needlegrass
Stipa pulchra	Purple Needlegrass
VINES	
Lathyrus laetiflorus	Wild Sweet Pea

* = ground cover + = unusual and colorful fruits

Local Sources of Native Plants and Seeds

PLANTS	SEEDS
Matilija Nursery 8225 Waters Rd Moorpark, CA 93021 805-523-8604	**Albrights Seed** 487 Dawson Drive Camarrillo, CA 93012 805-484-0551
Las Pilatas Nursery Las Pilatas Road Santa Margarita, CA 93453 805-438-5992	**S & S Seeds** P.O. Box 1275 Carpenteria, CA 93013 805-684-0436
Sperling Nursery Calabasas Road Calabasas, CA 91302 818-591-9111	**Santa Barbara Botanic Garden** 1212 Mission Canyon Rd Santa Barbara, CA 93105 805-682-4726
Theodore Payne Foundation 10459 Tuxford Street Sun Valley, CA 91352 818-768-1802	
Tree of Life Nursery 33201 Ortega Highway San Juan Capistrano, CA 92693 714-728-0685	

APPENDIX 7

COMMON AND CHARACTERISTIC OAK WOODLAND SPECIES OF LOS ANGELES COUNTY, CALIFORNIA

Draft Prepared by:
Dan Cooper
Rosi Dagit
Rebecca Latta

Common and characteristic oak woodland species of Los Angeles County, CA

This list is not meant to be exhaustive, but rather provides a sampling of species typical of oak woodlands throughout Los Angeles County, including lowland coast live oak (*Quercus agrifolia*) and Engelmann oak (*Q. engelmannii*) woodland, valley oak (*Q. lobata*) savannah, and foothill oak forest comprised of *Q. chrysolepis* and *Q. kelloggii*. The species listed are not necessarily associated with scrub oaks (e.g., *Q. berberidifolia*), which often support a chaparral plant and animal community distinct from that of oak woodland.

The list is intended to be used as a guide in quickly assessing the overall quality of oak woodland in the county - in general, intact oak woodland in the county should have many of many of these species; more degraded stands will have fewer. We recognize that there are hundreds of plant species associated with oak woodlands, as well as numerous invertebrates and vertebrates that have not been listed here. We hope this list provides a starting point for developing indicator species lists appropriate for the many oak woodland communities found in Los Angeles and look forward to recommendations as this draft undergoes public review.

Sources consulted included:

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Common and characteristic oak woodland species of Los Angeles County, CA		
Group	**Genus**	**Species**
Wildlife		
Mammals	*Odocoileus hemionus*	Mule deer
	Sciurus griseus	Western gray squirrel
	Eptisicus fuscus	Big brown bat
Birds	*Aqulia chrysaetos*	Golden eagle
	Accipiter cooperii	Cooper's hawk
	Buteo lineatus	Red-shouldered hawk
	Elanus leucurus	White-tailed kite
	Calipepla californica	California quail
	Columba fasciata	Band-tailed pigeon
	Strix occidentalis	Spotted owl
	Otus kennicottii	Western screech-owl
	Melanerpes formicivorus	Acorn woodpecker
	Picoides nuttallii	Nuttall's woodpecker
	Picoides villosus	Hairy woodpecker
	Colaptes auratus	Northern flicker
	Contopus sordidulus	Western wood-pewee
	Empidonax difficilis	Pacific-slope flycatcher
	Myiarchus cinerascens	Ash-throated flycatcher
	Vireo huttonii	Hutton's vireo
	Aphelocoma californica	Western scrub-jay
	Cyanocitta stelleri	Steller's jay
	Baeolophus inornatus	Oak titmouse
	Psaltiparis minimus	Bushtit
	Sitta carolinensis	White-breasted nuthatch
	Certhia americana	Brown creeper
	Sialia mexicana	Western bluebird
	Phainopepla nitens	Phainopepla
	Vermivora celata	Orange-crowned warbler
	Spizella passerina	Chipping sparrow
	Chondestes grammacus	Lark sparrow
	Junco hyemalis	Dark-eyed junco
	Pheucticus melanocephalus	Black-headed grosbeak
	Carpodacus purpureus	Purple finch
Reptiles & amphibians	*Aneides lugubris*	Arboreal salamander
	Batrachoseps nigriventris	Black-bellied slender-salamander
	Ensatina eschscholtzii	Ensatina
	Taricha torosa	Coast Range newt
	Diadophis punctatus	Ringneck snake
	Masticophis lateralis	Striped racer

	Tantilla planiceps	Western black-headed snake
	Clemmys marmorata	Western pond turtle
Invertebrates	*Adelpha californica*	California sister
	Bothriocyrtum californicum	Trapdoor spider
Plants		
Dicots	*Rhus ovata*	Sugar sumac
Dicots	*Rhus trilobata*	Squawbush
Dicots	*Toxicodendron diversilobum*	Poison-oak
Dicots	*Asclepias fascicularis*	Narrow-leaved milkweed
Dicots	*Artemisia douglasiana*	Mugwort
Dicots	*Lonicera spp.*	Honeysuckle
Dicots	*Symphoricarpus mollis*	Snowberry
Dicots	*Amorpha californica*	California false-indigo
Dicots	*Lathyrus laetiflorus*	Canyon pea
Dicots	*Quercus spp.*	Oaks
Dicots	*Pholistoma auritum*	Fiesta flower
Dicots	*Juglans californica*	California black walnut
Dicots	*Umbellularia californica*	California bay laurel
Dicots	*Clarkia unguiculata*	Elegant clarkia
Dicots	*Muhlenbergia rigens*	Deer grass
Dicots	*Thalictrum polycarpum*	Meadow rue
Dicots	*Rhamnus californica*	Coffeeberry
Dicots	*Rhamnus illicifolia*	Holly-leaved redberry
Dicots	*Heteromeles arbutifolia*	Toyon
Dicots	*Prunus illicifolia*	Holly-leaved cherry
Dicots	*Rosa californica*	California rose
Dicots	*Lithophragma affine*	Woodland star
Dicots	*Potentilla glandulosa*	Sticky potentilla
Dicots	*Ribes aureum*	Golden currant
Dicots	*Ribes speciosum*	Fuchia-flowered gooseberry
Dicots	*Keckiella cordifolia*	Heart-leaved penstemon
Dicots	*Mimulus aurantiicus*	Sticky monkey-flower
Dicots	*Hesperocnide tenella*	Western nettle
Dicots	*Viola pedunculata*	Johnny jump-up
Monocots	*Chlorogalum pomeranium*	Soaproot
Monocots	*Zigadenus fremontii*	Star lily
Ferns	*Pteridium aqualinum*	Bracken fern
Ferns	*Woodwardia fimbrata*	Giant chain fern

APPENDIX 8

SPECIAL STATUS SPECIES OF OAK WOODLANDS OF LOS ANGELES COUNTY, CALIFORNIA

Draft prepared by:
Dan Cooper
Rosi Dagit

Special Status Species Found in Oak Woodlands of Los Angeles County

The following list of special status plant species found in the oak woodlands of Los Angeles County was compiled primarily by using the CNPS Inventory of Rare and Endangered Plants and Rare vertebrates were compiled using the CNDDB "Quickviewer" function. Other sources consulted are listed below. Both were cross-referenced with known habitat preferences.

It is quite difficult to separate out species that only occur in oak woodlands, as several special status species also are found in habitat associations in addition to oaks. We recognize that the list is a first attempt at teasing out the relationships between oak woodlands and special status species and look forward to input as the draft undergoes public review. Because oak woodland assemblages are so varied within Los Angeles County, it is possible that we missed locally rare, threatened or endangered species. Therefore, just because a species is not found on this list, that does not mean it could not be added!

Abbreviations used include:
ESA – Federal Endangered Species Act
CSEA – California Endangered Species Act
SSC – Species of Special Concern (as noted by California Department of Fish and Game)

California Native Plant Society (CNPS) Ranking System abbreviations:
1A – Presumed extinct in California
1B - Rare, Threatened or Endangered in California and elsewhere
2 – Rare, Threatened or Endangered in California but more common elsewhere
3- Plants about which we need more information
4 – Plants of limited distribution – a watch list

CNPS Threat Ranks:
0.1 – Seriously threatened in California (high degree/immediacy of threat)
0.2 – Fairly threatened in California (moderate degree/immediacy of threat)
0.3 – No very threatened in California (low degree/immediacy of threat)

References:

California Department of Fish and Game, 2009. Threatened and Endangered Species List

CNPS Inventory of Rare and Endangered Plants, 7th Ed. : http://cnps.site.aplus.net/cgi-bin/inv/inventory.cgi

Rare vertebrates were compiled using the CNDDB "Quickviewer" function:
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SPECIAL STATUS SPECIES OF OAK WOODLANDS OF LOS ANGELES COUNTY, CALIFORNIA

Latin name	English name	ESA	CESA	DFG status
Wildlife				
Perognathus alticolus inexpectatus	Tehachapi pocket mouse	None	None	SSC
Chaetodipus fallax fallax	northwestern San Diego pocket mouse	None	None	SSC
Taxidea taxus	American badger	None	None	SSC
Antrozous pallidus	pallid bat	None	None	SSC
Gymnogyps californianus	California condor	Endangered	Endangered	
Elanus leucurus	white-tailed kite	None	None	FP
Accipiter cooperii	Cooper's hawk	None	None	WL
Aquila chrysaetos	golden eagle	None	None	FP | WL
Falco columbarius	merlin	None	None	WL
Ammodramus savannarum	grasshopper sparrow	None	None	SSC
Ensatina eschscholtzii croceator	yellow-blotched salamander	None	None	SSC
Taricha torosa torosa	Coast Range newt	None	None	SSC
Actinemys marmorata pallida	southwestern pond turtle	None	None	SSC
Anniella pulchra pulchra	silvery legless lizard	None	None	SSC
Aspidoscelis tigris stejnegeri	coastal whiptail	None	None	(was SSC)
Diadophis punctatus modestus	San Bernardino ringneck snake	None	None	(was SSC)
Lampropeltis zonata (parvirubra)	California mountain kingsnake (San Bernardino population)	None	None	SSC
Lampropeltis zonata (pulchra)	Califonia mountain kingsnake (San Diego population)	None	None	SSC
Thamnophis hammondii	two-striped garter snake	None	None	SSC
Clemmys marmorata	Western pond turtle	None	None	SSC
Oncorhynchus mykiss irideus	southern steelhead - southern California ESU	Endangered	None	SSC
Gila orcuttii	arroyo chub	None	None	SSC
Rhinichthys osculus ssp. 3	Santa Ana speckled dace	None	None	SSC
Gasterosteus aculeatus williamsoni	unarmored threespine stickleback	Endangered	Endangered	FP
Eucyclogobius newberryi	tidewater goby	Endangered	None	SSC
Onychomys torridus ramona	southern grasshopper mouse	None	None	SSC
Callophrys mossii hidakupa	San Gabriel Mountains elfin butterfly	None	None	SSC
Plants				
Acanthomintha obovata ssp. cordata	Heart-leaved thorn-mint	None	None	4.2
Androsace elongata ssp. acuta	California androsace	None	None	4.2
Anomobryum julaceum	Slender sliver moss	None	None	2.2
Asplenium vespertinum	Western spleenwort	None	None	4.2
Baccharis malibuensis	Malibu baccharis	None	None	1B.1
Baccharis plummerae ssp. plummerae	Plummer's baccharis	None	None	4.3
Berberis nevinii	Nevin's barberry	Endangered	Endangered	1B.1

Latin name	English name	ESA	CESA	CNPS Ranking
Brodiaea filifolia	Thread-leaved brodiaea	Threatened	Endangered	1B.1
Californica macrophylla	Round-leaved filaree	None	None	1B.1
Calochortus catalinae	Catalina mariposa-lily	None	None	4.2
Calochortus clavatus var. clavatus	Club-haired mariposa-lily	None	None	4.3
Calochortus plummerae	Plummer's mariposa-lily	None	None	1B.2
Calystegia peirsonii	Peirson's morning-glory	None	None	4.2
Camissonia lewisii	Lewis' evening-primrose	None	None	3
Chorizanthe parryi var. parryi	Parry's spineflower	None	None	1B.1
Clarkia xantiana ssp. parviflora	Kern Canyon clarkia	None	None	4.2
Dodecahema leptoceras	Slender-horned spineflower	Endangered	Endangered	1B.1
Dudleya cymosa ssp. agourensis	Agoura Hills dudleya	None	None	1B.2
Dudleya densiflora	San Gabriel Mountains dudleya	None	None	1B.1
Galium andrewsii ssp. gatense	Phlox-leaf serpentine bedstraw	None	None	4.2
Galium cliftonsmithii	Santa Barbara bedstraw	None	None	4.3
Galium grande	San Gabriel bedstraw	None	None	1B.2
Heuchera elegans	Urn-flowered alumroot	None	None	4.3
Horkelia cuneata ssp. puberula	Mesa horkelia	None	None	1B.1
Juglans californica	Southern California black walnut	None	None	4.2
Lilium humboldtii ssp. ocellatum	Humboldt lily	None	None	4.2
Malacothamnus davidsonii	Davidson's bush-mallow	None	None	1B.2
Microseris douglasii ssp. platycarpha	Small-flowered microseris	None	None	4.2
Monardella macrantha ssp. hallii	Hall's monardella	None	None	1B.3
Mucronea californica	California spineflower	None	None	4.2
Nemacladus gracilis	Slender nemacladus	None	None	4.3
Pentachaeta aurea ssp. aurea	Golden-rayed pentachaeta	None	None	4.2
Perideridia pringlei	Adobe yampah	None	None	4.3
Phacelia mohavensis	Mojave phacelia	None	None	4.3
Piperia cooperi	Chaparral rein orchid	None	None	4.2
Piperia leptopetala	Narrow-petaled rein orchid	None	None	4.3
Polygala cornuta var. fishiae	Fish's milkwort	None	None	4.3
Pseudognaphalim leucocephalum	White rabbit-tobacco	None	None	2.2
Quercus durata var. gabrielensis	San Gabriel Mountains leather oak	None	None	4.2
Quercus engelmannii	Engelmann oak	None	None	4.2
Rupertia rigida	Parish's rupertia	None	None	4.3
Selaginella asprella	Bluish spike-moss	None	None	4.3
Senecio aphanactis	Chaparral ragwort	None	None	2.2
Symphyotrichum defoliatum	San Bernardino aster	None	None	1B.2
Symphyotrichum greatae	Greata's aster	None	None	1B.3

The following species could be associated with oak woodlands, but more information is needed.

Latin Name	English Name	FEDSTATUS	CALSTATUS	DFGSTATUS
Macrotus californicus	California leaf-nosed bat	None	None	SSC
Myotis yumanensis	Yuma myotis	None	None	
Myotis evotis	long-eared myotis	None	None	
Myotis thysanodes	fringed myotis	None	None	
Myotis volans	long-legged myotis	None	None	
Myotis ciliolabrum	western small-footed myotis	None	None	
Lasionycteris noctivagans	silver-haired bat	None	None	
Lasiurus cinereus	hoary bat	None	None	
Lasiurus blossevillii	western red bat	None	None	SSC
Lasiurus xanthinus	western yellow bat	None	None	SSC
Euderma maculatum	spotted bat	None	None	SSC
Eumops perotis californicus	western mastiff bat	None	None	SSC
Nyctinomops femorosaccus	pocketed free-tailed bat	None	None	SSC
Nyctinomops macrotis	big free-tailed bat	None	None	SSC
Aglaothorax longipennis	Santa Monica shieldback katydid	None	None	
Trimerotropis occidentiloides	Santa Monica grasshopper	None	None	
Diplectrona californica	California diplectronan caddisfly	None	None	
Socalchemmis gertschi	Gertsch's socalchemmis spider	None	None	
Pristiloma shepardae	Shepard's snail	None	None	
Xerarionta intercisa	horseshoe snail	None	None	
Xerarionta redimita	wreathed cactussnail	None	None	
Tryonia imitator	mimic tryonia (=California brackishwater snail)	None	None	
Graphis saxorum	Baja rock lichen	None	None	
Texosporium sancti-jacobi	woven-spored lichen	None	None	

APPENDIX 9

FUNDING SOURCES AVAILABLE FOR OAK WOODLAND CONSERVATION

Draft Prepared by:
Rosi Dagit

This is a partial list of potential ways property owners can find assistance in conserving their oak woodlands.

1.Partners for Fish and Wildlife, U.S. Fish and Wildlife Service

Website: http://partners.fws.gov Contact: 916-414-6462
Goals:

- Implement pro-active, voluntary, on-the-ground habitat restoration projects that benefit Federal trust fish and wildlife species on private and tribal lands.
- Develop partnerships to implement these habitat restoration projects.
- Demonstrate applied technology for habitat restoration projects to help the public understand and participate in fish and wildlife resource conservation.

Funding available: 50:50 cost share
Requirements: Must own the land, must agree to maintain for 10 years

2.Wildlife Habitat Improvement Program, National Resources Conservation Service

website:http://www.nhq.nrcs.usda.gov/PROGRAMS/whip/
Contact: 805-386-4489

State Priorities:

- Riparian and stream corridor habitat restoration and enhancement that benefit wildlife corridors, water quality improvement, reduction in flood damage, and more.
- Federal or State threatened or endangered species habitat restoration or enhancement.
- Treatment or improvement of habitats in uplands (e.g. restoration of burned areas, oak regeneration projects, etc.)
- Wetland area creation, restoration, enhancement and management.
- Coldwater fisheries habitat restoration and improvement (steelhead and rainbow trout)
- Habitat restoration and enhancement for game and other species (deer, quail, butterflies, etc.)

Funding available: up to $10,000 over 10 years, property owner contributes 25%
Requirements: Must own the land, must agree to maintain for 10 years

3. Center for Invasive Plant Management Grants

Website: cipm@montana.edu Contact: Janet Clark, 406-994-6832

Goals: Involving citizens in controlling invasive plants

Funding available: $400 – 10,000

4.Cost Share and Assistance Programs for California landowners and Indian Tribes

website: http://ceres.ca.gov/foreststeward/financial.html

List of program goals, types of projects considered, eligibility requirements and contact info.

5.Catalog of Federal Domestic Assistance

Website: www.cdfa.gov

On-line catalog updated annually contains information on all financial and non-financial assistance programs provided by the Federal government

6. D.I.R.T Grants from Powerbar

website: www.powerbar.com/whoWeAre/dirt

Goals:
Endeavor to increase or maintain access to the outdoors or the size of an outdoor recreational resource.

Have a regional or local focus.
Identify a specific land area or waterway that will benefit.

Have a real potential for success or significant measurable progress over a short term.

Be quantifiable (i.e. have specific goals, objectives, and action plans) and include a measure for evaluating success.

Funding available: $1,000-5,000
Requirements: see website

7. Wildlife Conservation Board Oak Woodlands Conservation Program

Website: www.wcb.ca.gov Contact: 916-445-8448

Goals:

The Oak Woodlands Conservation Act (2001) created the Oak Woodlands Conservation Program administered by the Wildlife Conservation Board. The specific legislation focuses these efforts on the following:

1. Support and encourage voluntary, long-term private stewardship and conservation of California oak woodlands by offering landowners financial incentives to protect and promote biologically functional oak woodlands;
2. Provide incentives to protect and encourage farming and ranching operations that are operated in a manner that protect and promotes healthy oak woodlands;
3. Provide incentives for protection of oak trees providing superior wildlife values on private land, and;
4. Encourage planning that is consistent with oak woodland preservation.

Funding available: Varies

Up to 80% of funds are directed towards purchase of easements, restoration and enhancement

20% of funds may be used for public education and outreach

20% may be used for grants to provide technical assistance or develop oak conservation elements in general plans

Requirements: See website

APPENDIX 10

FEDERAL, STATE AND LOCAL OAK WOODLANDS CONSERVATION PROGRAMS (Preliminary List)

Draft Prepared by:
Rosi Dagit

The following is a list of agencies and organizations that provide existing programs to assist in the conservation and restoration of oak woodlands in Los Angeles County. We modified the list in the YOLO County Oak Woodland Conservation and Enhancement Plan to include relevant local entities. This is a preliminary list!

1. FEDERAL

National Park Service, Santa Monica Mountains National Recreation Area (SMMNRA)
Scientists from the SMMNRA have worked extensively in mapping the vegetation throughout the Santa Monica Mountains, and monitoring wildlife populations.

Natural Resources Conservation Service (NRCS)
NRCS works with landowners in a variety of ways, but two incentive programs funded by the Farm Security and Rural Investment Act of 2002 (Farm Bill) are most applicable to oak woodland conservation.

- The Environmental Quality Incentives Program (EQIP) provides 75% funds needed to projects that promote agricultural production and environmental quality. In Los Angeles, the program goals include water quality protection and erosion control, as well as protection of at-risk species through habitat conservation. The landowner must provide at least 25% of the total cost in either cash or in-kind contributions.

- The Wildlife Habitat Incentive Program (WHIP) is more focused on projects that directly benefit wildlife.

Both programs require cooperative planning with NRCS staff and opportunities for applying varies yearly.

United States Forest Service (USFS)
The Angeles National Forest is the largest forest located within an urban area in the country. Parts of the Los Padres National Forest straddle the western border of the county. The foothill and montane oak woodland communities found within the National Forests comprise the largest segments remaining in the county.

2. STATE

California Department of Fish and Game (CDFG)
CDFG has been a partner or provided funding for extensive research and restoration on numerous species that reside in oak woodlands of Los Angeles County. They are the responsible agency charged with the protection of local wildlife.

California Department of Forestry and Fire Protection (CDF)

CDF has several small cost-sharing opportunities to promote protection of working forests, including oak woodlands. These include the Forest Legacy Program which provides assistance for obtaining conservation easements, the California Forest Improvement Program covers development of management plans, oak planting, tree shelter installation and non-commercial thinning or pruning projects. The Vegetation Management Program assists in prescribed burns.

California Department of Parks and Recreation (CDPR)
As the largest public landowner in the Santa Monica Mountains, CDPR protects and restores oak woodlands in Leo Carrillo, Los Encinos State Historic Park, Malibu Creek, Topanga State Park, and numerous other parks within Los Angeles County. Active restoration and prescribed burns have contributed to maintaining the integrity of oak woodlands throughout the mountains.

California Oak Foundation (COF)
Although COF has state-wide outreach, they have participated in the development of the Los Angeles County Oak Woodland Conservation Management Plan in many ways.

California Urban Forest Council (CaUFC)
Since most of the oak woodlands of Los Angeles County are located within or adjacent to highly developed urban areas, the wildlife interface management issues are of great concern to CaUFC.

California Native Plant Society (CNPS)
There are several local chapters of CNPS located within Los Angeles County. Each provides extensive education and outreach efforts, including active restoration projects within oak woodlands.

Caltrans Adopt-A-Highway Program
This program provides opportunities for local residents, organizations or businesses to help maintain sections of California Highways. Volunteers can collect litter, plant trees or wildflowers, remove graffiti and /or control vegetation. See their website for specific guidelines.

Mountains Recreation Conservation Authority (MRCA)
MRCA is a joint powers authority between the Santa Monica Mountains Conservancy, the Conejo Recreation and Park District and the Rancho Simi Recreation and Park District. They are dedicated to the preservation and management of over 60,000 acres of open space, parkland, watersheds, trails and wildlife habitat.

Resource Conservation District of the Santa Monica Mountains (RCDSMM)
Conservation biologists from the RCDSMM have been involved in oak woodland conservation and preservation through on the ground restoration efforts as well as by participating in policy development. The RCDSMM coordinates several local watershed councils and works extensively with landowners to encourage voluntary conservation.

University of California Natural Reserve System
Stunt Ranch, locates on 310 acres in the Cold Creek watershed of the Santa Monica Mountains. Numerous oak woodland education and research programs are provided.

University of California Cooperative Extension (UCCE) Los Angeles County
UCCE provides research based information on a variety of subjects relevant to oak woodland conservation including fuel modification strategies, and watershed protection.

University of California Los Angeles (UCLA)
Professors and students have been an integral part of the research and planning efforts undertaken to help understand the role of oak woodlands in sustaining the biodiversity and ecological integrity of the Los Angeles region.

University of California Integrated Hardwood Range Management Program (IHRMP)
Researchers from IHRMP have been involved in promoting local and regional conservation planning efforts directed at protecting remaining oak woodlands in Los Angeles County.

Wildlife Conservation Board (WCB) Oak Woodland Conservation Program
The program offers landowners, cities, and counties the opportunity to obtain funding for projects that will protect, conserve and restore oak woodlands.

3. LOCAL

Arroyo Seco Foundation
The Arroyo Seco Watershed reaches from the San Gabriel Mountains into downtown Los Angeles. Their coordinated community efforts focus on maintaining the integrity of this important watershed that contains significant oak woodlands.

Audubon Society, Debs Park
This wonderful example of a LEEDS certified building provides extensive education and outreach to the community. It is located within chaparral and oak woodlands.

Los Angeles Community Forest Advisory Committee
Established in 1999, this appointed group of fourteen advises the LA City Council on tree related issues.

Los Angeles County Arboretum
The Arboretum contains 127 acres of plantings, including the last remaining native stand of Engelmann oak woodlands.

Los Angeles County Forestry
Although part of the Fire Department, County Forestry is charged with assisting in administering the Oak Tree Protection Ordinance, providing on-site consultations to property owners and propagating oaks and oak associated species for local residents. They are instrumental in protecting and preserving oak woodlands throughout the county.

Los Angeles County Parks and Recreation District

Responsible for all the parks and nature centers within unincorporated Los Angeles County, the Parks and Recreation District manages significant stands of oak woodland throughout the county.

NorthEast Trees
NorthEast Trees has coordinated extensive outreach, education and restoration projects in the densely populated and challenged communities of Los Angeles.

Pasadena Beautiful
The oaks trees of Pasadena are a matter of importance to the community, resulting in extensive education and outreach as well as preservation projects to protect their oak resources.

Rancho Santa Ana Botanical Garden
Although not located within Los Angeles County, the Garden has an extensive collection of native oaks and is involved in education and outreach regarding oak woodlands.

Santa Clarita Open Space Preservation District
Dedicated to protecting the rare biological and geological resources surrounding the city, the residents of Santa Clarita added an annual property tax assessment to provide funds to secure a greenbelt around development. Oak woodlands are one of the dominant habitats in the city.

Santa Clarita Organization for Planning the Environment (SCOPE)
Dedicated to protecting the natural resources of the Santa Clarita Valley, SCOPE has been actively involved in protecting oak woodlands. They were the key organization involved in publicizing the fate of "Old Glory", a valley oak.

Sierra Club
Active on many levels, members of the Sierra Club have been involved in numerous efforts to protect and preserve oak woodlands in Los Angeles.

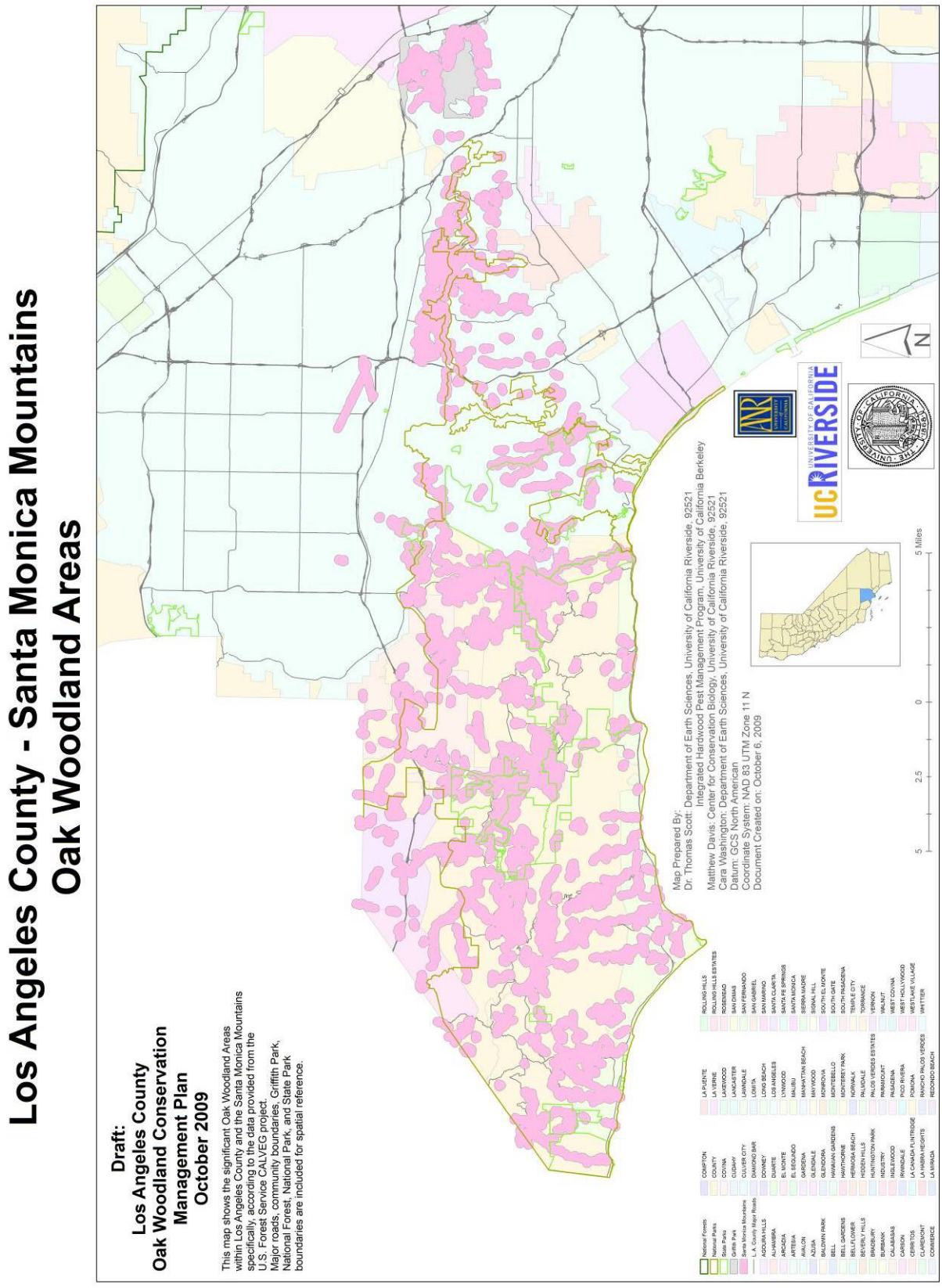
TreePeople
For many years TreePeople have made planting and protection of trees in Los Angeles a priority. They are currently involved in several oak woodland planting and restoration projects.

Tree Musketeers
A youth driven environmental organization that has planted many trees and provides education and outreach on the benefits of native plants.

APPENDIX 11

SMALL SCALE OAK WOODLAND AREA MAPS FOR LOCALIZED AREAS

Draft Prepared by:
Dr. Thomas Scott
Matthew Davis
Cara Washington


Los Angeles County - Santa Monica Mountains
Oak Woodland Areas
Draft:
Los Angeles County
Oak Woodland Conservation
Management Plan
October 2009
This map shows the significant Oak Woodland Areas within Los Angeles County and the Santa Monica Mountains specifically, according to the data provided from the U.S. Forest Service CALVEG project.
Major roads, community boundaries, Griffith Park, National Forest, National Park, and State Park boundaries are included for spatial reference.
Map Prepared By:
Dr. Thomas Scott: Department of Earth Sciences, University of California Riverside, 92521
Integrated Hardwood Pest Management Program, University of California Berkeley
Matthew Davis: Center for Conservation Biology, University of California Riverside, 92521
Cara Washington: Department of Earth Sciences, University of California Riverside, 92521
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Coordinate System: NAD 83 UTM Zone 11 N
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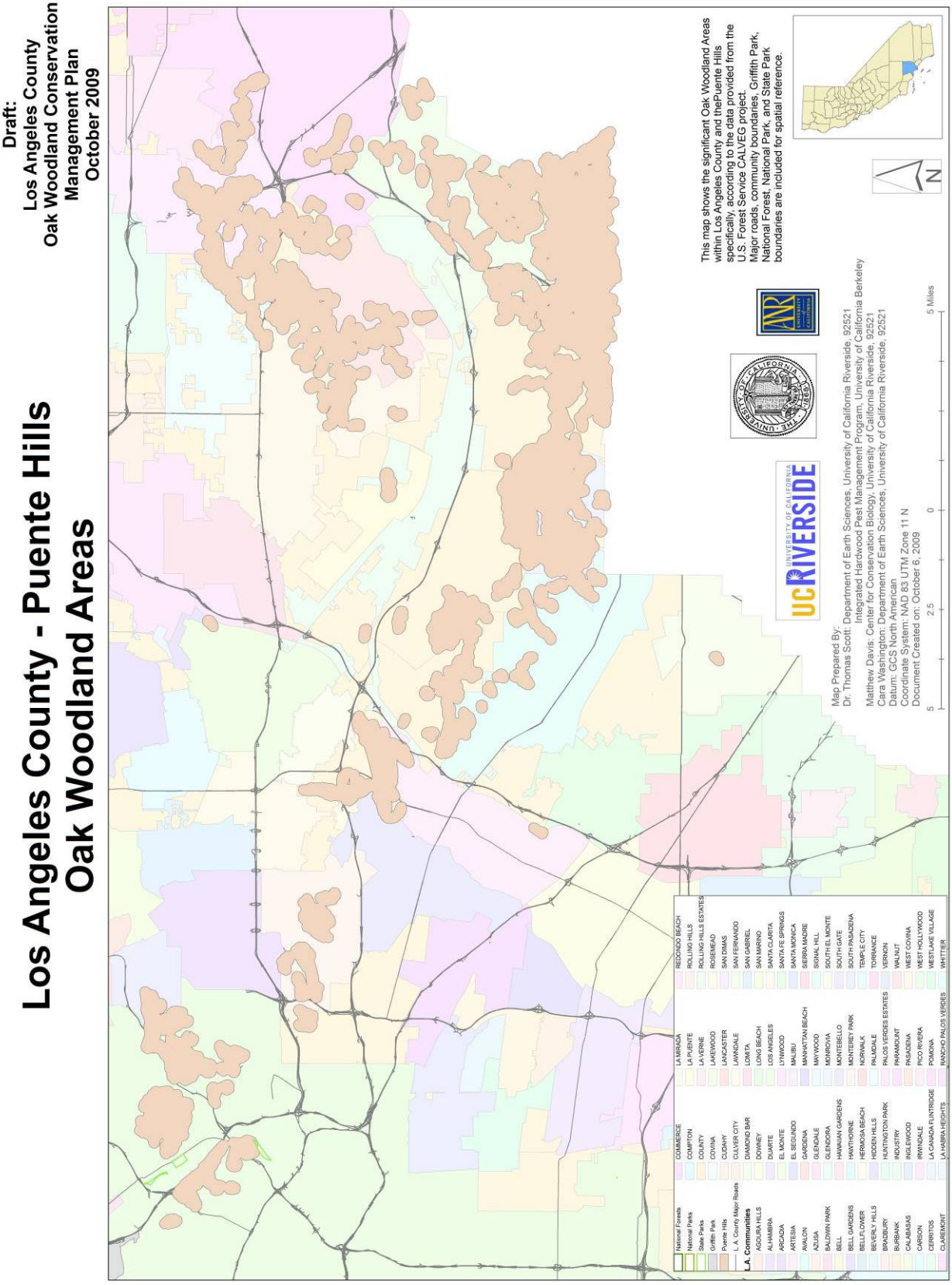
Draft:
Los Angeles County
Oak Woodland Conservation
Management Plan
October 2009
Los Angeles County - Puente Hills
Oak Woodland Areas
This map shows the significant Oak Woodland Areas within Los Angeles County and thePuente Hills specifically, according to the data provided from the U.S. Forest Service CALVEG project. Major roads, community boundaries, Griffith Park, National Forest, National Park, and State Park boundaries are included for spatial reference.
Map Prepared By:
Dr. Thomas Scott: Department of Earth Sciences, University of California Riverside, 92521
Integrated Hardwood Pest Management Program, University of California Berkeley
Matthew Davis: Center for Conservation Biology, University of California Riverside, 92521
Cara Washington: Department of Earth Sciences, University of California Riverside, 92521
Datum: GCS North American
Coordinate System: NAD 83 UTM Zone 11 N
Document Created on: October 6, 2009
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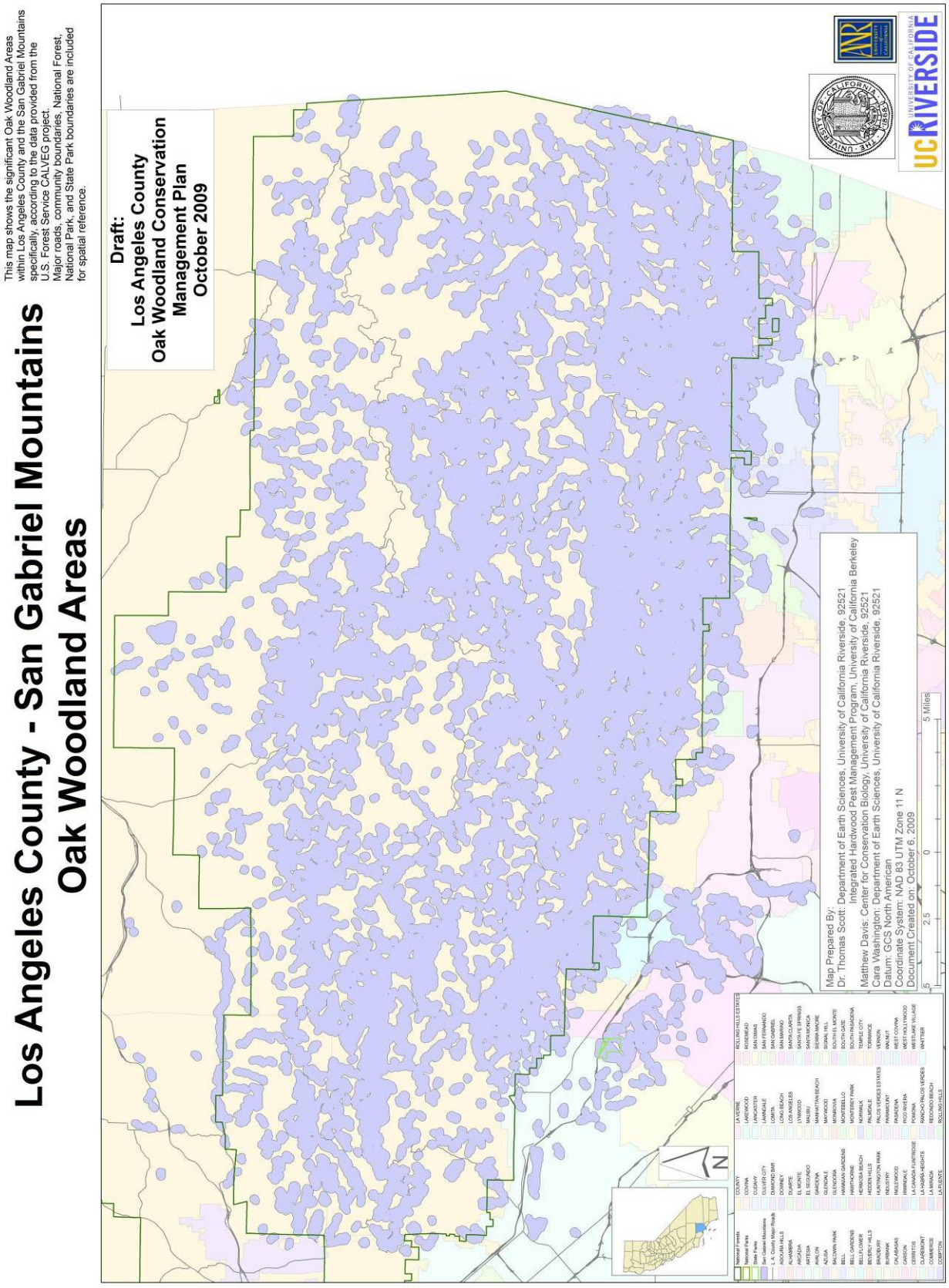
National Forests
National Parks
State Parks
Griffin Park
Puente Hills
L.A. County Major Roads
L.A. Communities
AGOURA HILLS
ALHAMBRA
ARCADIA
ARTESIA
AVALON
AZUSA
BALDWIN PARK
BELL
BELL GARDENS
BELLFLOWER
BEVERLY HILLS
BRADBURY
BURBANK
CALABASAS
CARSON
CERRITOS
CLAREMONT
COMMERCE
COMPTON
COUNTY
COVINA
CUDAHY
CULVER CITY
DIAMOND BAR
DOWNEY
DUARTE
EL MONTE
EL SEGUNDO
GARDENA
GLENDALE
GLENDORA
HAWAIIAN GARDENS
HAWTHORNE
HERMOSA BEACH
HIDDEN HILLS
HUNTINGTON PARK
INDUSTRY
INGLEWOOD
IRWINDALE
LA CANADA FLINTRIDGE
LA HABRA HEIGHTS
LA MIRADA
LA PUENTE
LA VERNE
LAKEWOOD
LANCASTER
LAWNDALE
LOMITA
LONG BEACH
LOS ANGELES
LYNWOOD
MALIBU
MANHATTAN BEACH
MAYWOOD
MONROVIA
MONTEBELLO
MONTEREY PARK
NORWALK
PALMDALE
PALOS VERDES ESTATES
PARAMOUNT
PASADENA
PICO RIVERA
POMONA
RANCHO PALOS VERDES
REDONDO BEACH
ROLLING HILLS
ROLLING HILLS ESTATES
ROSEMEAD
SAN DIMAS
SAN FERNANDO
SAN GABRIEL
SAN MARINO
SANTA CLARITA
SANTA FE SPRINGS
SANTA MONICA
SIERRA MADRE
SIGNAL HILL
SOUTH EL MONTE
SOUTH GATE
SOUTH PASADENA
TEMPLE CITY
TORRANCE
VERNON
WALNUT
WEST COVINA
WEST HOLLYWOOD
WESTLAKE VILLAGE
WHITTIER


Los Angeles County - San Gabriel Mountains
Oak Woodland Areas
This map shows the significant Oak Woodland Areas within Los Angeles County and the San Gabriel Mountains specifically, according to the data provided from the U.S. Forest Service CALVEG project. Major roads, community boundaries, National Forest, National Park, and State Park boundaries are included for spatial reference.
Draft:
Los Angeles County
Oak Woodland Conservation
Management Plan
October 2009
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Map Prepared By:
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Integrated Hardwood Pest Management Program, University of California Berkeley
Matthew Davis: Center for Conservation Biology, University of California Riverside, 92521
Cara Washington: Department of Earth Sciences, University of California Riverside, 92521
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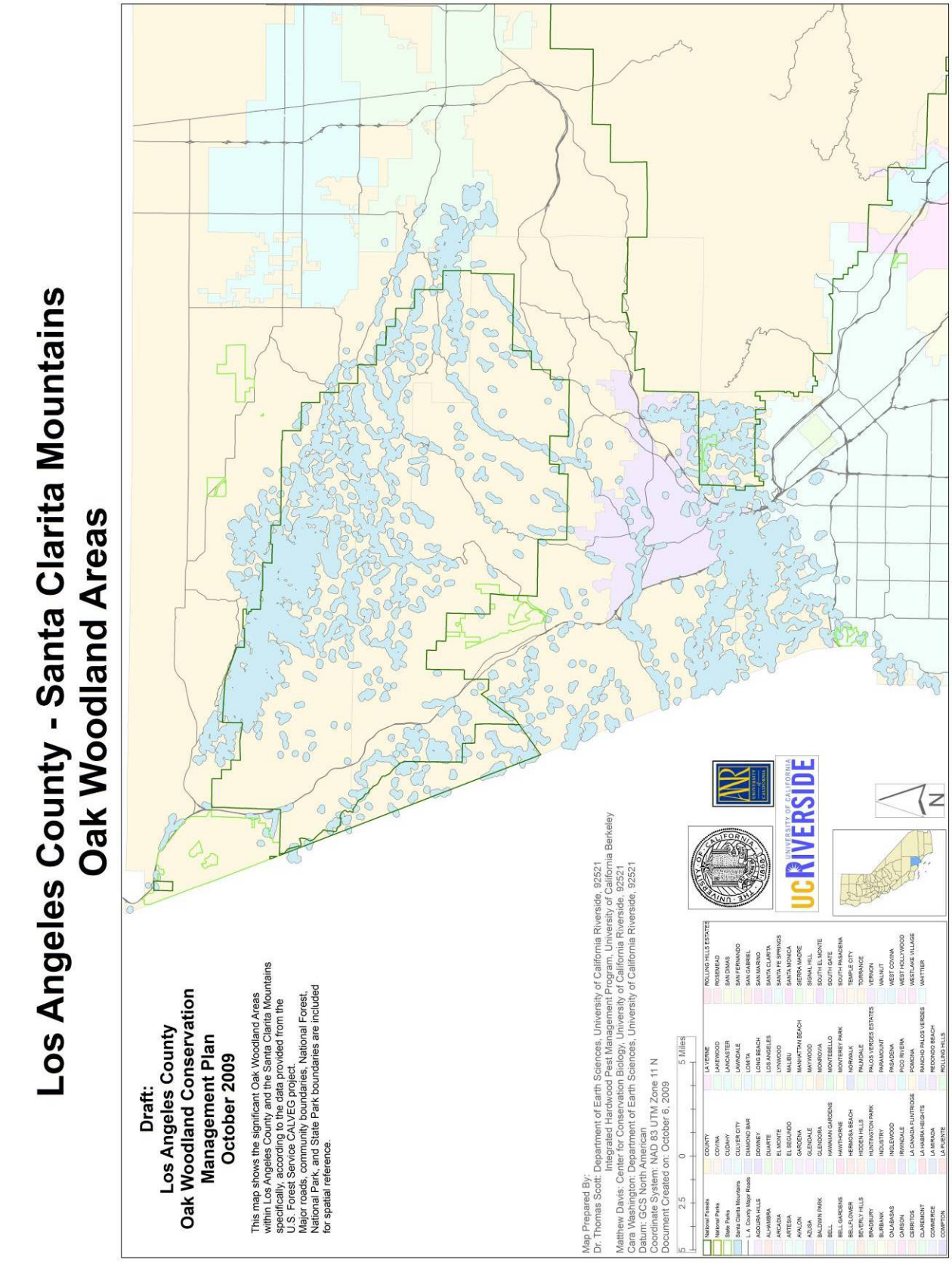
Los Angeles County - Santa Clarita Mountains
Oak Woodland Areas
Draft:
Los Angeles County
Oak Woodland Conservation
Management Plan
October 2009
This map shows the significant Oak Woodland Areas within Los Angeles County and the Santa Clarita Mountains specifically, according to the data provided from the U.S. Forest Service CALVEG project.
Major roads, community boundaries, National Forest, National Park, and State Park boundaries are included for spatial reference.
Map Prepared By:
Dr. Thomas Scott: Department of Earth Sciences, University of California Riverside, 92521
Integrated Hardwood Pest Management Program, University of California Berkeley
Matthew Davis: Center for Conservation Biology, University of California Riverside, 92521
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Datum: GCS North American
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National Forests
National Parks
State Parks
Santa Clarita Mountains
L.A. County Major Roads
AGOURA HILLS
ALHAMBRA
ARCADIA
ARTESIA
AVALON
AZUSA
BALDWIN PARK
BELL
BELL GARDENS
BELLFLOWER
BEVERLY HILLS
BRADBURY
BURBANK
CALABASAS
CARSON
CERRITOS
CLAREMONT
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HUNTINGTON PARK
INDUSTRY
INGLEWOOD
IRWINDALE
LA CANADA FLINTRIDGE
LA HABRA HEIGHTS
LA MIRADA
LA PUENTE
LA VERNE
LAKEWOOD
LANCASTER
LAWNDALE
LOMITA
LONG BEACH
LOS ANGELES
LYNWOOD
MALIBU
MANHATTAN BEACH
MAYWOOD
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PALMDALE
PALOS VERDES ESTATES
PARAMOUNT
PASADENA
PICO RIVERA
POMONA
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WESTLAKE VILLAGE
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